HEALTH ASPECTS OF PESTICIDES

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U.S. ENVIRONMENTAL PROTECTION AGENCY

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OFFICE OF PESTICIDE PROGRAMS

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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73-2539. Jenkins, R. P.; Delvo, H. W.; Fox, A. S. (Farm Production Econ. Div., Econ. Res. Serv., USDA, Washington, DC 20250). **Economic impact of discontinuing farm use of chlordane.** *Agr. Econ. Rep. No. 231, Washington, 1972, 15 p.* (6 references)

Discontinuing farm use of chlordane and substituting other methods of insect control would result in higher costs of all crops considered except cotton. A $1.56 million cost increase for alternative pest control is estimated. About 90% of that would be incurred by corn production; per acre cost would rise from $2.03 to $8.80; only about 7% would be needed for potato production. Tomato and tobacco producers would have to spend approximately $12,000 and $14,000 over their current expense for chlordane. In addition, yield losses of $14,000 for strawberries, broccoli, brussels sprouts, lettuce, and other vegetables, and about $93,000 for citrus fruits would arise. Possible substitutes for chlordane include carbaryl, diazinon, phorate, EPN, parathion, and methyl parathion.

73-2540. Huette, P. (Montabaur, Germany). **Walderhaltung als Aufgabe des Forstschutzes im Spannungsfeld des Umweltschutzes. [Forest maintenance as a task of forest protection within the field of environmental protection.]** *Allg. Forstz. 28(20): 488-489; 1973.* (German)

The economics of modern forestry, including high labor and land costs, require the use of chemicals to enhance efficiency of production. Public concern for the environment, however, demands that pesticides be applied as cautiously and even as inconspicuously as possible. The German Plant Protection Law of 1968 states that only officially approved pesticides may be used in forestry. However, many questions remain unresolved with respect to effects of pesticide residues on wildlife. The conflicting opinions on pesticide dangers which are expressed in the scientific press and are sometimes reported in the popular press as well may confuse the layman. Press releases concerning planned spraying programs may help improve the level of public information and allay unfounded fears.

73-2541. Bulla, Jr., L. A. (ed.) (Author address not given). **Regulation of insect populations by microorganisms.** *Ann. N. Y. Acad. Sci. 217: 1-243; 1973.* (928 references)

The papers in this monograph were selected to outline the current status of research on microbial control of insects, as an outgrowth of discussions at the 1971 annual meeting of the American Society for Microbiology. The papers fell within the areas of theory and application of insect control; means for insect regulation; biological factors that affect the success of microbial insecticides; procedural factors that affect the success of microbial insecticides; and establishing priorities. Participants concluded that bacteria, viruses, fungi, and protozoa have tremendous potential for use as insect control agents. The distribution of these microorganisms or their toxins, environmental factors external and internal to the host, and the integrated use of other means of control all affect the success of microbial insecticides. Since industrial pesticide research in general is declining and there is less incentive to develop microbial than chemical insecticides, private, governmental and university sectors must seek workable incentives for development of these alternative controls.

73-2542. Association of American Pesticide Control Officials Incorporated (Washington, DC). **Official Publication 1972-1973.** *Association of American Pesticide Control Officials Incorporated, Washington, 1972, 109 p.*

This manual contains types of information generally found in publications of organizations: bylaws, officers' names, and membership lists. Also included are models for a State Pesticide Control Act and a State Pesticide Use and Application Act. Regulations for a State Insecticide, Fungicide, and Rodenticide Act are presented. The Association's official pesticide product sampling procedure is outlined. Reports are presented from workshops conducted during the 26th Annual Meeting in Des Moines, Iowa, Aug. 8-10, 1972. Also presented are reports from the legislation committee concerning legal controls for pesticide application, from the computerized application control programs committee, and from the precautionary labeling committee. The recent activities of the National Agricultural Chemicals Association and of the Pesticides Regulatory Division of EPA are reviewed.

73-2543. Wurster, C. F. (Marine Sci. Res. Cent., State Univ. New York, Stony Brook, NY). **DDT misinterpreted again.** *BioScience 23(7): 401; 1973.*

A reply to various letters to *BioScience* indicates that Thomas Jukes was unqualified to testify on behalf of DDT since he has done no work in this field. He was not asked to reappear to the hearings after the examiner excused him using prematurity as a reason. More recent data on the Bermuda petrel still indicates that reproduction in these birds is not back to normal although the downtrend may have stabilized. More studies on the effects of DDT on phytoplankton have substantiated earlier results indicating inhibition of growth or photosynthesis, and since algal species are differentially sensitive to the pesticide changes could take place in the make-up of algal communities in the ocean. At the end of this series of letters the editor of *BioScience* issued the following statement: "We have decided that we have provided ample opportunity for the expression of conflicting views on the DDT and other pesticides issue. Until we receive something new, fully scientific and constructive, we will return all material submitted on this subject."

73-2544. Grice, R. E.; Hayes, M. H. B.; Lundie, P. R.; Cardew, M. H. (Dept. Chem., Univ. Birmingham B15 2TT, England). **Continuous flow method for studying adsorption of organic chemicals by a humic acid preparation.** *Chem. Ind. (London) 5: 233-234; 1973.* (4 references)

A continuous flow technique was developed for studying the adsorption of prometone and other pesticides on a model hydrogen ion-saturated humic acid (H+-HA) preparation. An ultrafiltration cell, connected to a reservoir via a concentration/dialysis selector valve and two supplementary valves for bleeding off air, was filled to capacity with stock suspension of H+ -HA, and the suspension was washed with water. Prometone was passed through the cell and assayed in the eluate, which was collected on a fraction collector. Wash-out curves were obtained by passing water through the cell instead of the adsorbate solution. The method offers several advantages over the conventional slurry technique, including constant approximate equilibrium concentration, and can be used for adsorption isotherm recording on dilute adsorbate solutions.

73-2545. Pillsbury, A. F. (Univ. California, Los Angeles, CA). **Environmental quality in California.** *Civil Eng. (New York) 43(7): 50-52; 1973.*

In California, and in the country as a whole, too much emphasis has been placed on governmental control of pesticides and other factors affecting environmental quality. Overreaction resulted in the banning of DDT, a compound with no evidence of harmful effects to man and a history of usefulness in public health and agriculture. Results of pesticide residue analysis, which is often indirect and can detect trace quantities, must be interpreted by trained people, and concern for human life and the whole ecosystem should be taken into consideration in decisions regarding pesticides.

73-2546. Fowler, B. A. (Nat. Inst. Environ. Health Sci., P. O. Box 12233, Research Triangle Park, NC 27709). **Heavy metals in the environment: an overview.** *Environ. Health Perspect. 4: 107-108; 1973.*

The symposium on "Heavy Metals in the Environment," sponsored by the National Institute of Environmental Health Sciences, clearly indicated that heavy metals such as lead exert toxic effects on many biological systems and that much work remains to be done in this field. Papers on the toxic effects centered on the metabolism and storage of these metals in relation to observed neuro- and nephrotoxicity. One of the major mechanisms of toxicity of heavy metals is intracellular inactivation of proteins. Extensive distribution of these metals in the agricultural environment has had a clear impact on organisms used as food by man. Epidemiologic studies underway should lead to a better understanding of their potential toxicity to man at environmental levels. Two new procedures introduced for monitoring mercury and other heavy metals depend on bombardment by protons to yield characteristic X-rays and on the use of metal chelators and GC.

73-2547. Commoner, B. (Author address not given). **Workplace burden.** *Environment 15(6): 15-20; 1973.* (14 references)

The history of PCBs (polychlorinated biphenyls) illustrates the relationship between many recently recognized environmental pollutants and occupational diseases. In 1933, the first case of chloracne due to PCBs was recorded; although this was followed by many similar reports, little scientific or industrial attention was given to the situation. With recent concern for the environment came the discovery that PCBs were concentrated in the tissues of wildlife and have various toxic effects. Much of the environmental pollution with PCBs and other organochlorines could have been avoided if concern had been shown at the beginning for the occupational problems created by these compounds. The volume of information now accumulating on environmental effects of pollutants helps ensure the safety and health of workers exposed to pollutants before they enter the environment.

73-2548. Price, J. D.; Walla, W. J. (ed.) (Texas Agr. Ext. Serv., Texas A & M Univ., College Station, TX 77843). **Extension Reference Manual, Pesticides (Southern Region).** *Texas Agr. Ext. Serv., College Station, 1973, 330 p.*

An introductory section provides a general orientation on pesticides, their purposes, uses, and misuse. The manual contains specific information concerning legal aspects and regulations on pesticide use, buying and selling pesticides, safe use and preparation of pesticides, protective measures to use against exposure, record keeping, power sprayers, calibration methods, plant disease control, fungicides, nematicides and fumigants, weed and brush control, herbicides, chemicals to aid in harvesting, rodent control, handling of accidental spills, container disposal, decontamination, safe storage, fire hazards, and toxicity.

73-2549. Guyer, G. E. (Dept. Entomol., Michigan State Univ., E. Lansing, MI 48823). **The pesticide paradox.** *Fed. Proc., Fed. Amer. Soc. Exp. Biol. 32(7): 1763-1765; 1973.*

The consumer has become more concerned about the quality of the environment and about the quality of food he buys; the same legislation which governs pesticide residues allowed on food also restricts the amount of insect debris present. Resolving these seemingly contradictory demands requires more research and sound scientific judgment on the risk/benefit ratio of various pesticides. Since the selective use of pesticides is expected to continue rising, particularly in urban and

industrial situations, more programs must be established to educate people on proper use and disposal of pesticides. Substitutes for the more persistent chemicals are often acutely toxic to humans and other species; the more desirable biological controls are not yet capable of reducing most pests economically.

73-2550. Anonymous. **[Did D.D.T. come to its end?]** *Harefuah 83(6): 255-256; 1972.* (6 references) (Hebrew)

Although DDT was synthesized in 1875, it was not used as a pesticide until 1940. Since it was readily accessible, stable, and non-toxic to infants, DDT was widely used in medicine, public health (preventing malaria and typhus), and agriculture. The controversy over DDT started in the late 1950s when scientists from the EPA and NAS discussing the dangers of DDT to animals and humans suggested reduced use of DDT. Very stable to light and air, DDT accumulates in animals, often with fatal results. With the discovery of other pesticides (such as parathion), presumed less harmful, DDT use was banned in the U. S. except for some pharmaceutical and public health (quarantine) reasons. This restriction did not affect or include exporting DDT. In Israel, for one, DDT will remain in use in agriculture and public health until new pesticides–better, cheaper, and less dangerous–are developed.

73-2551. Antonov, G. N. (USSR Ministry Chem. Ind., Moscow, USSR). **Proizvodstvo pestitsidov i blizhayshiye perspektivy ikh razvitiya. [Pesticide production and its short-term prospects.]** *Khim. Sel. Khoz. 10(5): 322-325; 1972.* (Russian)

State-of-the-art and short-term prospects of pesticide production in the USSR are surveyed. With the use of DDT for farm crops prohibited, organochlorine pesticide production will decrease and emphasis will be on enriched hexachlorane (BHC), polychlorocamphene (toxaphene), hexachlorobutadiene, and heptachlor. Trichlorfon, DDVP (dichlorvos), phthalophos, fenitrothion, and phosalone will be the leading organophosphorus products produced in the period ending 1975. Copper-base products, zineb, captan, and polycarbazine will be the chief fungicide preparations. Granosan, TMTD (thiram), copper trichlorophenate, and other low-toxicity seed dressing agents will be available. Preparations on the basis of phenoxyacetic acid, sodium trichloroacetate, nitrofen, simazine, propazine, dalapon, propanil, 2,4-D derivatives, linuron, and fluometuron will be the most common herbicides; magnesium chlorate, cyanamid, calcium chloride-chlorate, and butyphos (DEF) will be the major defoliants and desiccants.

73-2552. Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chem. Plant Protect., Moscow, USSR). **Pestitsidy i okhrana okruzhayushchey sredy. [Pesticides and environmental protection.]** *Khim. Sel. Khoz. 11(1): 31-34; 1973.* (32 references) (Russian)

Persistent, accumulating pesticides including organochlorine compounds and especially DDT, organic mercury, and arsenic compounds generate environmental concern. DDT and DDE have been repeatedly detected in human adipose tissue, milk, surface water, and aquatic life to which DDT is relatively toxic. However, the percentage of fish death caused by DDT and other pesticides is less than 2.2% worldwide; pesticides least toxic to fish are fungicides, herbicides other than treflan, organophosphorus pesticides, carbamates, and urea derived compounds. DDT and PCB are decomposed by soil bacteria, light, and other factors. Data from various countries, particularly from West Germany and the U. S., indicates a steady increase of organochlorine and organic mercury pesticide residues in humans, animals, and foods. An asymmetric analog of DDT has been synthesized with comparable insecticidal properties but easily degraded.

73-2553. Fontaine, M. (Mus. Nat. Hist. Natur., Physiol. Gen. et Comp., Paris, France). **L'action des polluants sur la vie marine. Du choix de criteres experimentaux. [Effects of pollutants on marine life–choice of experimental criteria.]** *IN: Marine Pollution and Sea Life, Fishing News (Books) Ltd., London, 1972, pp. 194-203.* (55 references) (French)

Effects of pollutants on marine organisms are reviewed for their possible use in the development of long-term toxicity tests. Low concentrations of DDT inhibit photosynthesis in marine algae and demonstrate sublethal effect of pollutants on single-celled organisms. Alterations in subcellular structures can indicate mutagenicity as well as directly affecting the organisms. Since organophosphate and organochlorine pesticides inhibit digestion in fish, alimentary and circulatory catheterization techniques have been developed for repeated sampling during analysis of metabolic effects of pesticides on fish; calorimetric methods are used for measuring direct and indirect effects of pesticides on respiration. Recently developed ion flux measurement methods will be used for investigating pollutant effects on osmoregulatory and ionoregulatory systems. Reproductive tests used for detecting effects on a wide range of organisms entail examining cell division of marine phytoplankton; studying development of fertilized eggs and larvae of echinoderms, molluscs, crustacea, and fish; and tracing growth and fertility of adult molluscs, crustaceans, and fish in the presence of pollutants.

73-2554. Organisation for Economic Co-Operation and Development (OECD Publications Center, Suite 1207, 1750 Pennsylvania Avenue, Washington, DC 20006). **Problems of Persistent Chemicals. Implications of Pesticides and Other Chemicals in the Environment.** *O.E.C.D. Publications, Paris, 1971, 113 p.*

Internationally planned investigations are needed concerning the consequences and limitation of chemicals

having undesirable effects on man through persistence, environmental distribution, or accumulation in various organisms. Consideration is given to chemicals which can be regarded as potentially hazardous. Comprehensive investigations of certain organochlorine compounds, notably the polychlorinated biphenyls, of mercury compounds, and of those containing other heavy metals are noted. A continuing information exchange between countries is encouraged. In the future the Organisation for Economic Co-Operation and Development should help countries strike a balance among beneficial use of chemicals, economics of use or misuse, and limitations in regard to public health and ecology. The implications of national legislation in relation to other countries are mentioned.

73-2555. Benstead, J. C. (Agr. Chem. Develop., Shell Chem. Pty., Ltd., Australia). **Recent developments in agricultural chemicals.** *Process Chem. Eng. 26(3): 20-21; 1973.*

A number of changes have been seen in recent years in the availability and use of pesticides and in their regulation by legislation. More selective materials, systemic pesticides, and compounds of lower toxicity have appeared. Mixtures have become increasingly more popular since application of one pesticide often leads to an increase in population of a previously unimportant pest. Due to the increasing complexity and consequent increasing cost of developing new materials, a number of companies have withdrawn from the field. Legal control of pesticides in Australia, formerly handled by the States, is being made more uniform by examination of toxicology and efficacy of the pesticides by Australian government committees.

73-2556. Fussell, E. M. (ed.) (Naval Air Station, Alameda, CA 94501). **Proceedings of the Seminar on Environmental Ecology and Pesticides.** *Navy Disease Vector Ecology and Control Center, Alameda, 1972, 148 p.*

Papers presented at this seminar, May 25-27, 1971, provide information on the following topics: current progress in environmental problems; the death of sea lions in California coastal waters; epidemiology of mercury poisoning; source, distribution, and effects of polychlorinated biphenyls in wildlife; and production and fate of chemicals in the environment. Also discussed are: percutaneous absorption of toxicants; investigations of chemical contaminants in water and in food; legislation at the federal level and in the state of California regarding pesticides; use of pesticides in the Department of Defense; pesticides as carcinogens; the role of the Environmental Protection Agency; storage and disposal of pesticides; the problem of insecticide resistance; and future trends in entomology.

73-2557. Peakall, D. B. (Sect. Ecol. Syst., Langmuir Lab., Cornell Univ., Ithaca, NY 14850). **Polychlorinated biphenyls: occurrence and biological effects.** *Residue Rev. 44: 1-21; 1972.* (75 references)

PCBs have been shown to be widespread in the environment. The levels found tend to parallel total DDT in concentration. PCBs are frequently the dominant organochlorine compounds present. Since PCBs are highly stable, they can be expected to persist in the environment for many years. The action of the Monsanto Company in restricting the use of these materials to closed circuits should greatly reduce the input of PCBs into the environment in North America. It is hoped that companies outside the United States will follow suit. The acute toxicity of PCBs is low although impurities such as the chlorinated dibenzofurans are highly toxic. Preliminary results suggest that PCBs are embryotoxic in the ten ppm range in the diet. While definite work on mammals remains to be carried out, the indications are that the decision to limit environmental input is a wise one. (Author abstract by permission)

73-2558. Locatelli, M.; de Falco, G. (Pestic. Dev. Cent., Montecatini Edison Co., Buenos Aires, Argentina). **The regulation of pesticides in Argentina.** *Residue Rev. 44: 39-64; 1972.*

The basic aspects of pesticide legislation and pest control in the Republic of Argentina are discussed. Registration of a pesticide is subject to approval of the relevant label by the Registro Nacional de Terapeutica Vegetal. To this end, results of biological tests must be submitted to demonstrate the effectiveness of the product under consideration, together with bibliographical information on chemical aspects and toxicology. The Registro Nacional makes up for the lack of a toxicological classification with investigations into the characteristics of any product submitted for consideration, this body being entitled to approve or modify the restrictions on use or the safety intervals recommended by the technical advisor of the applicant firm. Special sections cover problems connected with surveillance and control over pesticides, as well as over any firm concerned with their application for the sake of profit and any producer engaged in controlling those agents which are referred to by law as pests of agriculture. Maximum residue limits (tolerances) have been established for agricultural products and by-products. A mechanism is now being adopted for the determination of the safety (minimum) intervals to be indicated on the label of any pesticide offered for sale. (Author abstract by permission, abridged)

73-2559. Lu, F. C. (Food Addit. Unit, WHO, Geneva, Switzerland). **Toxicological evaluation of food additives and pesticide residues and their "acceptable daily intakes" for man: the role of WHO, in conjunction with FAO.** *Residue Rev. 45: 81-93; 1973.* (23 references)

In recent years the number and amount of intentional additives and residues of pesticides in our food

have increased. While these chemicals serve useful purposes, concern has been expressed regarding their possible health hazards. To protect the health of the consumer and to allay his apprehension, health authorities have taken various actions. At an international level, WHO in conjunction with FAO has regularly convened meetings of Expert Committees to provide toxicological evaluation of these chemicals. Some of these have been considered unsuitable for use in food while others needed additional data to establish their safety, but for a majority of them acceptable daily intakes (ADI's) for man have been established. The consumer risk has been assessed by comparing the potential intakes of these chemicals with their ADI's. With the exception of only a few food additives and pesticide residues, the potential intakes are well below the corresponding ADI's. The possible overestimation and underestimation of the potential intakes are discussed. The Joint FAO/WHO Codex Alimentarius Commission helps to protect the health of the consumer and to facilitate international trade of food by elaborating international acceptable standards and provisions for pesticide residues and food additives. (Author abstract by permission)

73-2560. World Health Organization Expert Committee on Insecticides (Geneva, Switzerland). **Specifications for Pesticides Used in Public Health (4th Ed.).** *WHO, Geneva, 1973, 333 p.*

The nomenclature, composition, chemical and physical requirements, packing and marking of packages, and methods for determining chemical and physical properties for DDT, BHC, lindane, methoxychlor, dieldrin, pyrethrins, diazinon, malathion, trichlorfon, fenthion, dichlorvos, fenitrothion, propoxur, and abate are presented. Distinction is made between the various physical forms in which these insecticides are used, e.g., water-dispersible powders, emulsifiable concentrates, dusting powders, and larvicidal oils. The rodenticides, coumachlor, warfarin, zinc phosphide, and pindone, are similarly treated. Similar information is presented for the molluscicides, copper sulfate, pentachlorophenol, niclosamide (ethanolamine salt), and 4-tritylmorpholine, and the repellent, deet.

73-2561. Lech, J. J.; Pepple, S. K.; Statham, C. N. (Dept. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233). **Fish bile analysis: a possible aid in monitoring water quality.** *Toxicol. Appl. Pharmacol. 25(3): 430-434; 1973.* (13 references)

In vivo exposure of rainbow trout (*Salmo gairdneri*) to ^{14}C-carbaryl, ^{14}C-3-trifluoromethyl-4-nitrophenol (TFM), and ^{14}C-DDT has demonstrated that the concentration of radioactivity from these compounds in bile is much greater than that in the surrounding water. Since, with several of the compounds, the bile-to-water ratios rise to greater than 1000 in a 24-hr exposure period, the use of biliary sampling may be of potential use in monitoring water quality by taking advantage of this bioconcentration mechanism. (Author abstract by permission)

73-2562. Weyl, W. L. (Author address not given). **Ecology and human health.** *Va. Med. Mon. 100(7): 661-663; 1973.*

The fact that ecological concerns and health concerns are not always compatible is exemplified by the conflict over DDT. Although its use has helped reduce disease and increase food production, DDT has been banned in the United States despite a lack of clear evidence to prove it dangerous to humans. Many current DDT substitutes are hazardous to human health and may cause fatal accidents even when properly applied. A rational approach to decisions regarding the use of pesticides is needed, especially when residues of pesticides and disposal of pesticide containers can be major environmental problems. Chemicals should be applied in the minimum dose necessary to achieve the desired effect, and decisions concerning the carcinogenicity and mutagenicity of all pollutants should be based on human health experience rather than experimental animal data. Population studies would be useful in the establishment of acceptable risk-benefit standards.

73-2563. Anonymous. **Residu-tolerantie voor HCB binnenkort gewijzigd. [HCB residue tolerance soon to be modified.]** *Voedingsmiddelentechnologie 4(17): 25; 1973.* (Dutch)

Since scientific data regarding harmful effects of HCB (hexachlorobenzene) is not yet adequate for a full evaluation of the compound, the World Health Organization has recommended a safety factor 20 times greater than usual in determining residue tolerances. Using this safety factor, a residue tolerance of 0.5 ppm HCB in meat seems toxicologically defensible, and a modification to this effect will soon be published in the Netherlands Legal Gazette. The Feed Producers' Cooperative has already taken measures for reducing the HCB content of animal feed additives. As a result, the average HCB content in pork from the Netherlands has already fallen below the residue level of 0.3 ppm permitted in the United States.

73-2564. WHO Expert Committee on Schistosomiasis Control (Geneva, Switzerland). **Schistosomiasis control. Report of a WHO expert committee.** *WHO Tech. Rep. Series 515: 1-47; 1973.*

Successful schistosomiasis control programs have used molluscicides alone or in combination with chemotherapy and/or environmental controls. Niclosamide was most frequently used, and sodium pentachlorophenate was quite effective. Projects utilizing therapy with niridazole, tartar emetic and stibophen, and hycanthone were more successful when combined with mollusci-

cides. Provision of piped water supplies has contributed to the reduction of incidence of the disease through reduction of contact with stream water; changes in irrigation methods, particularly in rice production, have successfully reduced snail populations. Recently, more suitable, less toxic therapeutic agents have been developed, and some molluscicides of plant origin look promising from an economic standpoint. Niclosamide and *N*-tritylmorpholine are still preferable because of their low toxicity to non-target animals and their metabolism by several microorganisms.

73-2565. Wilkinson, D. E. (Wisconsin Dept. Agr., WI). **Protection and plenty.** *Wis. Dept. Agr. Bull. 107-70: 1-11; 1970.*

With the expected doubling of the population in the next 30 years the use of chemical and biological pest control methods will have to be intensified to increase the food yield from a shrinking crop land area. Successful biological control programs include screw worm eradication by male sterilization, release of corn borer parasites, and release of alfalfa weevil parasites. Chemical controls are not deliberately applied excessively by the farmer for economic or conservation reasons; however, pesticides to be marketed in the future must be shown safe at levels commonly used. Unwanted residues in food cause concern. Chronic exposure to greater than normal levels of pesticides is now being studied under a federal program to determine the effects of pesticides on health. Acute poisonings due to the misuse of farm insecticides, relatively rare in the U. S., have been reported only twice in Wisconsin. Monitoring programs have shown a general leveling off in the use of organochlorines and in the concentrations of these pesticides in lakes and waterways. This has been attributed in part to the federal and state laws governing the use of DDT.

73-2566. Isono, N. (Tokyo Metropolitan Univ., Dept. of Science, Tokyo, Japan). **[Environmental pollution by PCBs.]** *Yosui To Haisui (Water Waste) 14(9): 1109-1117; 1972.* (28 references) (Japanese)

PCB pollution of the ecological system, the route of pollution, the concentration and excretion of PCBs in the human body, and special cases of PCB residues in food are reviewed from previously published material. Total PCB production in Japan, the United States, and Canada; shipments of PCBs within Japan; PCB residues in birds, fish, animals, breast milk, and human adipose tissue; use of PCBs; and PCB contents in liquid industrial wastes, soil, packing material, and various foods are presented in tables. PCBs are eliminated through the intestines, skin, and lungs. When PCBs are taken orally, a certain percentage is absorbed through the intestine and the rest excreted; once absorbed, PCBs are neither excreted nor degraded. According to one investigation, the average PCB content in all food specimens was highest in saltwater fish at 0.9 ppm, in beans at 0.6 ppm, and in freshwater fish at 0.5 ppm. Residues in baby food, milk, chicken, beef, pork, powdered milk, and eggs were relatively low and ranged from 0.01 to 0.06 ppm.

73-2567. Anonymous. **Lebensmittelzusatz- und Begleitstoffe. Aenderung der Hoechstmengenverordnung Pflanzenschutz. [Food additives and contaminants. Changes in the regulations concerning maximum allowable concentrations of pesticides.]** *Z. Lebensm. Unters. Forsch. 151(3): 19-32; 1973.* (4 references) (German)

Modified regulations concerning maximum allowable concentrations of pesticide residues in or on plants, plant parts, and foodstuffs of vegetable origin are presented. Maximum allowable concentrations of several pesticides in different plants and corresponding foodstuffs are listed. Foodstuffs of vegetable origin must be free from aldrin, dieldrin, amitrole, aramite, arsenic compounds, lead compounds, cadmium compounds, chlordane, endrin, fluoroacetic acid and its derivatives, heptachlor, heptachlor epoxide, isobenzan, isodrin, kelevan, chlordecone, morfamquat, paraquat, mercury compounds, carbon disulfide, selenium compounds, TEPP, and carbon tetrachloride.

73-2568. Environmental Protection Agency (Washington, DC). **Agricultural Pollution of the Great Lakes Basin.** *U.S. Government Printing Office, Stock No. 5501-0134, 1971, 93 p.* (22 references)

Pollution in the Great Lakes system results from fertilizers, poultry and animal wastes, erosion, chlorides, road salt, and pesticides. Pesticides found in the water of the Great Lakes Basin area averaged 14 parts per trillion. Two types of chlorinated hydrocarbons were found: DDT and its metabolites; and dieldrin, which is here considered a metabolite of aldrin. Residues in soil were highest in orchard and vegetable crop areas with the largest portion present as DDT. Total residues in fish caught in major areas were less than 1 part per million in the muscle tissue except in fish from the Muskoka area which has been annually sprayed for the control of mosquito and black fly. Forests cover 40 million acres of land draining into the Great Lakes; 0.04% of this area is sprayed yearly with short-term insecticides which contibute to the pollution. The few herbicides used are of short duration.

73-2569. Kojima, S.; Saito, M.; Konno, H.; Ozawa, K. (Akita Prefect. Inst. Pub. Health, Akita, Japan). **[Results of investigation of organochlorine pesticide residues in mothers' milk and in blood of the mothers.]** *Akita-Ken Eisei Kagaku Kenkyu Shoho (Rep. Akita Prefect. Inst. Pub. Health) 16: 65-68; 1971.* (Japanese)

Organochlorine pesticide residues were determined twice in breast milk and once in blood of wives of farmers and non-farmers in 1971. BHC and DDT were detected in all specimens of breast milk both in the first and second investigation. Average contents in ppm for wives of farmers and non-farmers respectively during the first investigation were: α-BHC 0.002 and 0.0002, β-BHC 0.060 and 0.053, γ-BHC 0.001 and 0.001, δ-BHC $<$ 0.001 and $<$ 0.001, *p,p'*-DDD(TDE) 0.001 and 0.001, *p,p'*-DDE 0.034 and 0.030, *p,p'*-DDT 0.017 and 0.019, dieldrin $<$ 0.001 and $<$ 0.001, and no traces of *o,p'*-DDT, aldrin, and endrin. During the second investigation residues were: α-BHC 0.001 and 0.001, β-BHC 0.012 and 0.060, γ-BHC $<$ 0.001 and $<$ 0.001, *p,p'*-DDE 0.023 and 0.020, *p,p'*-DDT 0.016 and 0.018, and δ-BHC, *p,p'*-DDD, *o,p'*-DDT, aldrin, dieldrin, and endrin were not detected. The contents of δ- and β-BHC and dieldrin were less than the maximum allowable standard of the WHO or Japan. In 12 cases, however, the DDT content exceeded the standard. Only γ-BHC (average 0.006 and 0.004), *p,p'*-DDE (0.001 and 0.001), *p,p'*-DDT (0.003 and 0.005), and dieldrin (0.001 and 0.001) were found in the blood of mothers.

73-2570. Kojima, S.; Saito, M.; Konno, H.; Ozawa, K. (Akita Prefect. Inst. of Pub. Health, Akita, Japan). **[On the investigation of pesticide residues in foods.]** *Akita-Ken Eisei Kagaku Kenkyu Shoho (Rep. Akita Prefect. Inst. Pub. Health) 16: 69-72; 1971.* (Japanese)

Organochlorine pesticides (α-, β-, γ-, and δ-BHC, *p,p'*-DDD (TDE), *p,p'*-DDE, *p,p'*-DDT, *o,p'*-DDT, aldrin, dieldrin, and endrin) were determined in raw, raw-pooled, and market milk, cabbages, apples, Japanese radish, Japanese pear, strawberries, spinach, tomato, cucumber, and summer orange collected in 1970 and 1971. Raw milk was classified according to the main feed such as rice straw, pasture, and a combination of straw and pasture. No samples had *o,p'*-DDT, aldrin, dieldrin, or endrin except one of summer orange which had 0.006 ppm of dieldrin. Pesticide residues were smallest in raw milk from cows on pasture feed, with 0.008-0.004 ppm α-BHC and 0.033-0.015 ppm β-BHC. Residues of β-BHC decreased with time in milk from cows on rice straw and combined feed, but not in pasture feed. Results of determinations of pesticide residues in vegetables and fruits conducted in Dec. 1970 and June 1971 showed that the highest residue of α-BHC was detected in Japanese radish at 0.007 ppm, β-BHC at 0.014 ppm in cucumber, and of α-BHC at 0.010 ppm also in cucumber. DDT derivatives were highest in Japanese pear at 0.006 ppm.

73-2571. Colucci, A. V.; Hammer, D. I.; Williams, M. E.; Hinners, T. A.; Pinkerton, C.; Kent, J. L.; Love, G. J. (Hum. Stud. Lab., Nat. Environ. Res. Cent., EPA, Research Triangle Park, NC 27711). **Pollutant burdens and biological response.** *Arch. Environ. Health 27(3): 151-154; 1973.* (8 references)

Studies aimed at linking pollutant burdens to biological response and environmental exposure have yielded interesting preliminary results. Whereas easily collected specimens such as hair and blood have proven utility in estimation of environmental exposure, these tissues cannot, as yet, be considered a good quantitative indicator of many body pollutant burdens. Studies of occupationally exposed groups or groups of individuals with clinically evident disease have failed to clearly implicate pollutant burdens with either disease production or aggravation although, in general, the blood levels of these individuals do reflect increased exposure to pollutants. Studies of multiple tissue sets collected at autopsy are encouraging inasmuch as it appears these tissues will provide useful information about the pollutant burden for constructing predictive models, and, in addition, provide flashback capabilities. (Author abstract by permission)

73-2572. Edwards, J. G. (Dept. Entomol., California State Univ., San Jose, CA 95192). **DDT breaks down in marine environments.** *BioScience 23(7): 400; 1973.* (2 references)

A suggestion is made in a Letter-to-the-Editor that Philip A. Butler revise and publicize his more recent estimates of DDT persistence and retract some of his earlier statements which provided evidence for the banning of DDT. Although during his testimony Butler stated that

maximum DDT residues detected in oysters were 0.1 to 5.4 ppm, he later agreed that residues generally were < 0.1 ppm. He also stated that DDT might persist for as much as 40 years in terrestrial deposits and perhaps as long in estuarine silt deposits while his letter to *BioScience* suggested that DDT would disappear within one or two generations of sensitive estuarine fauna. The facts about DDT should be made available so that students realize that DDT quickly breaks down in marine environments and does not adversely affect marine organisms or build up in food chains.

73-2573. Stadelman, W. J. (Anim. Sci. Dept., Purdue Univ., W. Lafayette, IN 47907). **Record of some chemical residues in poultry products.** *BioScience 23(7): 424-428; 1973.* (38 references)

As early as 1950 studies indicated that chlorinated hydrocarbons (DDT) were concentrated in the body fat of poultry and transferred to a limited extent to the eggs. Turkeys and chickens accumulated in their fat from 4 to 8 times the DDT given in the feed over an 8-wk period. Levels in the chickens were high before economic loss could be detected, but it was evident that care was needed in the use of DDT on poultry farms. With the passage of the Delaney Amendment and the assumption of monitoring of pesticide residues in foods by the FDA, research in this area increased. Aldrin, BHC, chlordane, dieldrin, DDT, endrin, heptachlor, lindane, and methoxychlor, but not toxaphene, were detected in poultry in 1968 and in smaller amounts in 1971. Endrin accumulated to a greater degree in chickens than in hogs, lambs, dairy cattle, or beef cattle. Egg residues were generally detected when levels of pesticide were above 500 ppb in the feed. Restricted feeding and the use of androgens have been included in management of poultry to reduce residues, and cooking procedures have reduced the levels in foods. Polychlorinated biphenyls, which are more toxic to poultry than organochlorines, have accidentally contaminated hens and eggs on several occasions, and the use of these compounds in food or feed manufacture has been restricted. Hens act as an efficient screening mechanism in controlling human dietary intake of arsenic and selenium since these are poorly absorbed.

73-2574. Nakamura, T.; Ando, M.; Tamari, H.; Matsubayashi, E.; Uchiyama, M. (Agr. Chem. Res. Lab., Sankyo Co., Ltd., Shinagawa, Tokyo, Japan). **Residues of the acaricide proclonol in fruits and animal tissues.** *Bochu-Kagaku (Sci. Pest Contr.) 38(2): 99-105; 1973.* (19 references)

Samples of fruits and animal tissues were analyzed for proclonol residues using partitioning, Florisil chromatography, and saponification followed by electron capture GC. Fruit was taken from experimental fields in which trees had been sprayed 2-4 times with a 1500-fold dilution of 40% wettable powder or emulsifiable concentrate. Orange pulp contained no detectable residues (< 0.02 ppm), but the peel had residues of 1 to 7 ppm. From 0.46 to 0.63 ppm proclonol was found in apples, and no significant residues were found in pears since the fruits were covered during the growing period. None of the fruits contained residues higher than the permissible level. Rats fed diet containing up to 4000 ppm proclonol stored up to 39, 65, and 100 ppm in brain, kidneys, and liver; fatty tissues contained about 40 times more material than the liver. At lower dose levels marked differences were observed between the sexes in storage of the acaricide. The sex difference was not noticeable in mice, but the pattern of storage of the compound was similar to that observed in rats. Storage is nearly equal to that of dicofol and much lower than that of DDT.

73-2575. Wolfe, H. R.; Staiff, D. C.; Armstrong, J. F.; Comer, S. W. (Wenatchee Res. Sta., Environ. Protect. Agency, Wenatchee, WA). **Persistence of parathion in soil.** *Bull. Environ. Contam. Toxicol. 10(1): 1-9; 1973.* (7 references)

Experimental gross parathion contamination of soil was monitored for six years to determine degradation, leaching, and disappearance of the pesticide under spillage conditions. Levels of parathion in soil treated with the 45.6% emulsifiable concentrate ranged from 30,000 to 95,000 ppm initially, dropped rapidly during the first year, and much more slowly during the following years. At five years some of the 3-inch depth samples contained more than the 1-inch depth samples, and the lowest value found was 13,800 ppm at 1-inch. Very little occurred below the 9-inch level after six years. More dilute spray concentrations disappeared rapidly, initally, and then leveled off. The rate appeared to be higher when emulsifiable rather then wettable formulations were used. Fewer colonies of microorganisms were isolated from treated soil after two and five years than from control soil; resistance to parathion was not evident. The results indicate that high concentrations of parathion persist for a long time; spills should be dug up and disposed of where they will not present a hazard to animals, children, or the environment.

73-2576. Watson, M.; Pharaoh, B.; Gabica, J.; Benson, W. W. (Community Study on Pestic., Idaho Dept. Agr., Boise, ID 83702). **A note on serum *p,p'*-DDE and *p,p'*-DDT residues in persons taking sustained oral doses of Vitamin B6.** *Bull. Environ. Contam. Toxicol. 10(2): 65-69; 1973.* (7 references)

Because of the importance of pyridoxine (vitamin B6) as a cofactor in numerous metabolic reactions, the possibility of its involvement in the hepatic microsomal enzyme pathways involved in the breakdown of stored organochlorines was considered. Serum DDT and DDE levels were examined in nine (control) persons without occupational exposure to pesticides and in 15 persons

exposed occupationally to pesticides for at least three years. Vitamin B6 therapy with oral doses of 50 mg/day was then initiated, and further serum organochlorine analyses were performed at 3-week intervals for 12 weeks. Similar studies were also performed on a group of mentally retarded, institutionalized patients who were not taking any enzyme-inducing drugs. No significant variations in serum DDT or DDE levels following pyridoxine treatment were seen in any group. The mean DDE level prior to pyridoxine administration in the control group was 52.3 ppb, and after pyridoxine, 48.8 ppb. The mean DDT levels, respectively, were 10.1 and 10.1 ppb; standard deviations were high due to the small number of subjects. The mean serum DDE level in the pesticide-exposed group prior to pyridoxine administration was 63.1 ppb, and after pyridoxine, 64.9 ppb. Serum DDT levels in this group were 11.3 and 13.4 ppb, respectively.

73-2577. Collins, H. L.; Davis, J. R.; Markin, G. P. (U.S.D.A., APHIS Pest Management Program, Drawer EM, State College, MS 39762). **Residues of mirex in channel catfish and other aquatic organisms.** *Bull. Environ. Contam. Toxicol. 10(2): 73-77; 1973.* (14 references)

Channel catfish introduced after mirex bait application into a commercial fish pond previously used for minnow production accumulated peak residues of 0.65 ppm six months after treatment. Caged catfish fed commercial catfish food had no detectable mirex residues; caged fingerlings showed maximum residues of 0.03 ppm at six months. The slow accumulation of residues in caged and uncaged fish indicated that residues did not arise from consumption of bait particles. Other aquatic organisms analyzed contained from 0.01 to 2.88 ppm mirex. Since the test pond was "old" and, unlike commercial ponds in use, had a large accumulation of aquatic life, residues in these fish were probably higher than could be expected in commercial fish.

73-2578. MacLean, A. J.; Stone, B.; Cordukes, W. E. (Soil Res. Inst., Agr. Canada, Ottawa, Ontario, Canada). **Amounts of mercury in soil of some golf course sites.** *Can. J. Soil Sci. 53(1): 130-132; 1973.* (5 references)

Data obtained on the mercury content of soils from three golf courses treated until about 1964 with mercury fungicides indicates that mercury can be leached deeply into the soil and move laterally under some conditions. Average concentrations of mercury in samples of six greens were 53 ppm for soil and 57 ppm for turf, when the 0 to 5 cm layer was taken, while the concentrations in control soils averaged 0.07 ppm. Leaching into the fairways and retention in the subsoil layers of the fairways was greatest in clay loam soil and least in sandy soil.

73-2579. Khan, S. U. (Res. Sta., Agr. Can., Regina, Saskatchewan, Canada). **Interaction of humic substances with bipyridylium herbicides.** *Can. J. Soil Sci. 53(2): 199-204; 1973.* (16 references)

The binding or complexing of diquat and paraquat by humic acid and fulvic acid has been studied by the gel filtration technique. Paraquat was complexed by humic compounds in greater amounts than was diquat, but the amounts of the two herbicides complexed by humic acid were higher than those complexed by fulvic acid. By infrared spectroscopic technique, evidence is presented for the formation of charge-transfer complexes between diquat or paraquat and humic compounds. The complexing of bipyridylium herbicides by humic substances should be of interest to those concerned with environmental problems. (Author abstract by permission)

73-2580. Munson, T. O.; Huggett, R. J. (Westinghouse Ocean Res. Lab., Annapolis, MD 21404). **Current status of research on the biological effects of pesticides in Chesapeake Bay.** *Chesapeake Sci. 13(Suppl.): S154-S156; 1972.*

Data from the National Estuarine Monitoring Program for 1965-1970 indicates that DDT residues in oysters in the Chesapeake Bay generally ranged from 0.011 to 0.100 ppm. The highest value obtained in Virginia was 0.68 ppm compared with 0.07 ppm in Maryland. The oyster is a good indicator species for continuous monitoring since it purges itself rapidly as the pollution level drops. Usually, the highest pesticide levels in oysters were found in the James-Elizabeth River system, and dieldrin was detected only in this system. Polychlorinated biphenyls, found in all systems tested, seemed to be changing in composition from Aroclor 1242 to Aroclor 1254. Levels of organochlorines in surface films were three or four times higher than those in the rest of the water. An anadromous fish, the alewife, appeared to pick up pesticides as it moved up the Bay into the rivers. Investigation of crab kills revealed concentrations of DDT in the hepato-pancreas of dead or dying crabs up to 10 times those in live crabs. Only a few isolated cases of mortality have been directly attributed to pesticides, but sublethal and synergistic effects may be revealed in future monitoring programs.

73-2581. Leland, H. V.; Bruce, W. N.; Shimp, N. F. (Depts. Civ. Eng. Zool., Univ. Illinois, Urbana-Champaign, IL 61801). **Chlorinated hydrocarbon insecticides in sediments of southern Lake Michigan.** *Environ. Sci. Technol. 7(9): 833-838; 1973.* (22 references)

Past usage of organochlorine insecticides in states bordering southern Lake Michigan has resulted in the presence in the lake sediments of large reservoirs of DDT, DDE, DDD (TDE), and dieldrin. Analysis of surficial sediments from different areas of southern Lake Michigan indicated high positive statistical correlations between total DDT (DDT, DDE, DDD) and dieldrin

concentrations in the sample and organic carbon content. The amount of organic carbon in surficial sediments was directly proportional to the clay-size fraction of sediment. Dechlorination of DDT to form DDD apparently predominates under the reducing conditions of sediments on the eastern side of the south basin of Lake Michigan. In other areas, DDT is the principal component of the total DDT complex in sediments, and DDE and DDD are major degradative products. (Author abstract reprinted by permission of the American Chemical Society)

73-2582. Shtannikov, Ye. V. (Saratov Med. Inst., Saratov, USSR). **Obezvrezhivaniya vody, zagryaznennoi DDT i geksakhlortsiklogeksanom. [Decontamination of water contaminated with DDT and BHC.]** *Gig. Sanit. 37(9): 97-99; 1972.* (5 references) (Russian)

The efficiency of chlorination; filtration through sand, quartz sand, activated carbon, or ion exchange resins; coagulation; flocculation; sedimentation; and combinations thereof for decontaminating waters containing 0.2 mg of BHC and 2 mg of DDT per liter was studied. Coagulation even with high doses of aluminum sulfate and iron sulfate (50-150 mg/l.) was inefficient while coagulation with the addition of sodium carbonate to increase the water pH to 6.8-7.4 resulted in pesticide removal of 75 to 99%. Combinations of coagulation and sand filtration had removal efficiencies of 75-85%. An efficiency of 99% was achieved by coagulation with 5 mg of aluminum sulfate and 2 mg of polyacrylamide per liter, and supplementary sand filtration. A combination of coagulation, sedimentation, sand filtration, and chlorination with chloride of lime was efficient for relatively low pesticide concentrations only. Filtration through a 30-40 cm thick layer of activated carbon or ion exchange resin at a rate of 5-8 m/h had an efficiency of only 60-70% while a combination of anionic with cationic resin had a removal efficiency of 90-95%. The efficiency of quartz sand filtration was low at 10 to 30%.

73-2583. Ivanova, L. N.; Molozhanova, Ye. G. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers, Plastic Materials, Kiev, USSR). **Staticheskoye i dinamicheskoye raspredeleniye sevina v vneshney srede. [Static and dynamic distribution of carbaryl in the environment.]** *Gig. Sanit. 38 (2): 24-28; 1973.* (Russian)

The static distribution and the residue dynamics of carbaryl are mathematically calculated for air, soil, plants, and apple fruits. An apple orchard was treated with 1.36 kg of carbaryl per ha at 20-21°C and a wind speed of 1.5 m/sec. Leaves, fruits, and bark were calculated to have retained 27.35% of the carbaryl applied while 19.7% was present in the soil. Another 3% was present in the lower 1.5 m layer of the atmosphere with the rest having been entrained to distances of up to 1 km. Maximum carbaryl concentration in the soil at the end of the first day after application and minimum concentration in the air were determined. The secondary pollution of the air from carbaryl-contaminated soil and plant parts was most intense during the day and least intense at night. The time necessary for 99% of all carbaryl to be eliminated from the soil was calculated as 184 days. The soil carbaryl content, suspected of causing concentrations exceeding the maximum allowable value of 1 mg/m^3 persisted over the first 12 days after application with the most adverse conditions (maximum temperature of 38°C and a minimum wind velocity of 0.5 m/sec). The degradation of carbaryl in apples due to internal and environmental processes was complete in 34 days. Exponential relationship between concentration and time for carbaryl residues in the soil and fruits was established.

73-2584. Khasanov, V. Kh. (Khorezm Regional Sanit. Epidemiol. Station, Khorezm, USSR). **Okhrana vneshney sredy ot zagryazneniya pestitsidami pri ispol'zovanii ikh v khlopkovodstve. [Protection of the environment from pollution by pesticides in cotton growing.]** *Gig. Sanit. 38 (3): 107-108; 1973.* (Russian)

The concentrations of organophosphorus pesticides, especially methylmercaptophos (methyl demeton), in the air, irrigation water, and fruits grown in the Khorezm cotton growing region have abated considerably since 1970 when aerial application was banned. Subsequently, the pesticide application rate per hectare was reduced from an average of 6.1 kg to 3.4-4.1 kg. The air concentrations of organophosphorus pesticides in rural settlements decreased by more than 10 times, and no pesticide was detected in the air 3,500 meters from the application site.

73-2585. Hara, Y.; Masago, H.; Karino, K.; Takijima, T.; Fukushima, I.; Fujii, S.; Tano, T.; Kobayashi, T.; Kurihara, O.; Sudo, K.; Muto, T. (Gumma Prefect. Inst. for Pub. Health, Maebashi, Japan). **[On the pesticide residues in foods, first report. Organochlorine pesticide residues.]** *Gumma-Ken Eisei Kenkyu Sho–Gumma-Ken Kogai Kenkyu Senta Nenpo (Annu. Rep. Gumma Prefect. Inst. Pub. Health Cent. Study Environ. Pollut.) 4: 83-86; 1972.* (Japanese)

Organochlorine pesticide residues (α-, β-, γ- and δ-BHC, *p,p'*-DDT, aldrin, dieldrin, and endrin) were determined since December, 1971, in fruits, vegetables, commercial milk, and human milk. A fairly high *p,p'*-DDT residue of 0.34 ppm was found on apple samples. A relatively small amount of γ-BHC (far less than the tolerance) at 0.11 was detected in almost all vegetables and fruits except cucumber. Polychlorocyclodiene residues were not detected except in some cucumbers and some potato samples. Organochlorine pesticide residues were detected in almost all milk samples although in small amounts except in a few cases; aldrin and endrin were scarcely detected. Although aldrin,

endrin, and δ-BHC were not detected in breast milk, the content of β-BHC was relatively larger, at 0.016-0.003 ppm, than α- and γ-BHC (0.002-0.001 and 0.004-0.003). Residues of *p,p'*-DDT and dieldrin were noticeably high: 0.039-0.006 ppm and 0.012-0.002 ppm.

73-2586. McIntyre, Jr., S. C.; Causey, M. K. (Dept. Zool.-Entomol., Auburn Univ., Auburn, AL). **Insecticide residues in bobwhite quail associated with Alabama soybean production.** *J. Alabama Acad. Sci. 42(1): 28-33; 1971.* (11 references)

DDT and its metabolites were the major residues found in bobwhite quail collected in or very near insecticide-treated soybean fields. Levels averaged 17.08 ppm, much higher than the 7 ppm tolerance limit established by the FDA for commercial poultry. Birds collected from areas not recently treated with insecticides contained an average of 1.68 ppm total DDT entirely as DDE. Toxaphene was found in 5 of the 20 birds from treated areas, and heptachlor epoxide occurred in 3 of the birds. Although methyl parathion was commonly applied along with the organochlorines, no organophosphate residues were detected. Populations of bobwhite in treated areas do not appear to be affected by the residues, but further investigation is needed.

73-2587. Thompson, A. R. (Can. Dept. Agr., London, Ontario N6A 3KO, Canada). **Persistence of biological activity of seven insecticides in soil assayed with *Folsomia candida*.** *J. Econ. Entomol. 66(4): 855-857; 1973.* (14 references)

Folsomia candida Willem was used to assay persistence of toxic residues of dieldrin, isobenzan, phorate, chlorpyrifos, diazinon, Zinophos (thionazin), and carbofuran in Plainfield sand at 13 and 24 ± 1°C. At 13°C, residues of Zinophos, carbofuran, diazinon, and dieldrin killed all insects until 16 weeks after treatment of the soil at concentrations of 0.05 ppm to 0.5 ppm. The bioactivity of phorate persisted little more than one week, and isobenzan and chlorpyrifos were moderately residual, between the two extremes. Dieldrin was as persistent at 24°C as at 13°C, and the biological activity of isobenzan persisted slightly longer at the higher temperature. Phorate could again be classified as "slightly residual" and Zinophos, carbofuran, and chlorpyrifos were far less persistent at the higher temperature. (Author abstract by permission)

73-2588. Lichtenstein, E. P.; Fuhremann, T. W.; Schulz, K. R.; Liang, T. T. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Effects of field application methods on the persistence and metabolism of phorate in soils and its translocation into crops.** *J. Econ. Entomol. 66(4): 863-866; 1973.* (9 references)

The effects of application methods of phorate at 10 lb/acre on its metabolism, toxicity, and translocation into crops were studied under field conditions. Residues were least persistent when phorate was applied solely to the soil surface; six days were required until one half of the applied dosage could no longer be detected in the form of phorate and its metabolites. Residues were more persistent after the insecticide had been mixed with the upper 4- to 5-in soil layer, and 30 days were required until one half of the applied dosage could no longer be detected. Less than 1.6% of the applied phorate was measured 14 and 30 days after its application to the soil surface or the upper 4- to 5-in soil layer, respectively. Highest amounts of phorate sulfoxide (3.2 and 4.88 lb acre) were recovered from both field soils six days after phorate application. Subsequently, the concentration of phorate sulfoxide in these soils declined rapidly, while the amounts of phorate sulfone increased, until they in turn reached their peak (1.44 and 3.5 lb/acre) one month after soil treatment. Residues consisting entirely of phorate sulfone were found two months after application of phorate to the soil surface but five months after mixing of the insecticide with the upper soil layer. Insect mortalities were obtained with both field soils. Potatoes grown in these soils during 1971 and 1972 did not contain measurable insecticide residues. Corn silage contained phorate sulfone at 0.03 and 0.18 ppm in 1971, but no measurable residues in 1972. Carrots from both field plots contained in 1971 phorate sulfone at 0.12 and 0.50 ppm and in 1972 at 0.04 ppm after growing in the soil whose upper layer had originally been mixed with the insecticide. (Author abstract by permission)

73-2589. Schulz, K. R.; Lichtenstein, E. P.; Fuhremann, T. W.; Liang, T. T. (Dept. Entomol., Univ. Wisconsin, Madison, WI 53706). **Movement and metabolism of phorate under field conditions after granular band applications.** *J. Econ. Entomol. 66(4): 873-875; 1973.* (5 references)

Phorate residues moved in both vertical and horizontal directions after a granular band application of the insecticide at 5 and 10 lb/acre. This was determined by analyses of horizontal and vertical soil cores collected four and a half months after soil treatment 2 to 4 in away from the original band. Extracts of these soils were all toxic to *Drosophila melanogaster* Meigen, indicating that insects could still be controlled 2 to 4 in away from the place of the original phorate deposit. Contrary to findings with emulsifiable concentrates, phorate persisted for a relatively long period. Eight to 60% of total residues recovered from soil samples collected through the band were still in the form of phorate. Metabolism of phorate was most pronounced in the 5 lb/acre-treated soil and was relatively slower in the 10 lb/acre-treated soil. Phorate sulfone was the major component in all soil cores collected from the 5 lb/acre-treated soil, but only in soil cores collected below the original band treated at 10 lb of actual phorate/acre. The relative composition of vertical soil cores collected through the band (5 lb/acre applied) and 2 in away from it was phorate sulfone >

phorate sulfoxide > phorate, while in cores from the 10 lb/acre treated soil this composition was phorate > phorate sulfone > phorate sulfoxide. (Author abstract by permission)

73-2590. Nash, R. G.; Harris, W. G.; Lewis, C. C. (Agr. Res. Serv., U. S. Dept. Agr., Beltsville, MD 20705). **Soil pH and metallic amendment effects on DDT conversion to DDE.** *J. Environ. Qual. 2(3): 390-394; 1973.* (12 references)

High soil pH resulted in greater conversion of DDT to DDE in both nonamended and MgO-amended soils. The conversion of DDT continued throughout the experimental time of up to 32 months to a maximum of 15% of total residues as DDE. DDT was converted to DDE in both moist and dry soils above pH 7. The predominant conversion mechanism in moist soils appears to be microbial whereas chemical conversion appears to be dominant in dry soils. Soils amended with MgO required pH values of near 10 before DDT conversion became significant. $CaCO_3$, a dolomitic lime, Fe_2O_3, or Al_2O_3 applied to soils with a wide range of pH values did not enhance DDT conversion to DDE. Laboratory experiments indicate that the liming of soils containing DDT is not a practical means of converting DDT to DDE. (Author abstract by permission)

73-2591. Khan, S. U. (Res. Sta., Can. Dept. Agr., Regina, Saskatchewan, Canada). **Interaction of *S*-2,3,3-trichloroallyl *N,N*-diisopropylthiolcarbamate (triallate) with montmorillonite.** *J. Environ. Qual. 2(3): 415-417; 1973.* (7 references)

Adsorption of triallate by montmorillonite saturated with various cations was studied by infrared spectroscopy. The coordination of triallate to the exchangeable cations on the clay occurred through the oxygen of the carbonyl group. The triallate-montmorillonite complexes were stable even on heating to 50°C for 15 days, but when shaken with distilled water, the herbicide was completely displaced from the clay. (Author abstract by permission)

73-2592. Gaskin, D. E.; Frank, R.; Holdrinet, M.; Ishida, K.; Walton, C. J.; Smith, M. (Dept. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario, Canada). **Mercury, DDT, and PCB in harbour seals (*Phoca vitulina*) from the Bay of Fundy and Gulf of Maine.** *J. Fish. Res. Bd. Can. 30(3): 471-475; 1973.* (7 references)

Samples of blubber, longissimus muscle, liver, and cerebrum from 12 harbor seals (*Phoca vitulina*) were analyzed for DDT, dieldrin, PCBs, and total mercury content. The results were compared with those obtained previously for harbor porpoises (*Phocoena phocoena*). DDT and PCB levels appear to be of the same magnitude in the fat of seals from both southern New Brunswick and southern Maine, being lowest in a lactating female. Virtually no *o,p'*-DDT and relatively little dieldrin were found in seal fat, in contrast to porpoises, which contained significant amounts of both in the depot fat. Mercury levels were generally similar to those found for porpoises, but total liver Hg was considerably greater in adults from the New Brunswick islands than in those from the southern Maine ledges. (Author abstract by permission)

73-2593. Addison, R. F.; Kerr, S. R.; Dale, J. (Fish. Res. Bd. Can., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, N. S., Canada). **Variation of organochlorine residue levels with age in Gulf of St. Lawrence harp seals (*Pagophilus groenlandicus*).** *J. Fish. Res. Bd. Can. 30(5): 595-600; 1973.* (16 references)

Blubber samples from 18 harp seals taken near the Saguenay River in the Gulf of St. Lawrence were analyzed for DDT metabolites, PCBs, and dieldrin. The concentration of total DDT and metabolites (Σ DDT) ranged from 3.1 to 22.6 ppm, PCBs from 2 to 22 ppm, dieldrin from 0.1 to 0.3 ppm of blubber. Rank correlation of residue level and age indicated that significant portions of the Σ DDT and PCB variance could be assigned to increased residue levels with age. Within the Σ DDT group, DDE alone showed a strong proportional increase in concentration with age. Dieldrin concentration was not appreciably correlated with age. Among factors other than age, changes in blubber thickness did not account for any significant amount of the variance in blubber residue concentrations. Examination of other published data suggested that parturition and/or lactation may cause reductions in blubber residue concentrations. (Author abstract by permission)

73-2594. Smith, W. E.; Funk, K.; Zabik, M. E. (Dept. Food Sci. Hum. Nutr., Michigan State Univ., East Lansing, MI 48823). **Effects of cooking on concentrations of PCB and DDT compounds in chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon from Lake Michigan.** *J. Fish. Res. Bd. Can. 30(5): 702-706; 1973.* (12 references)

Concentrations of polychlorinated biphenyls (PCBs) and DDT compounds in chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon steaks were reduced slightly by cooking. In chinook poaching and baking caused reductions of PCBs and pesticides of 2-8% while baking in nylon cooking bags reduced residue levels 11-16%. No significant differences in residue levels were found between chinook steaks cooked with and without skin, while steaks from the anterior halves contained less PCB and pesticide on a fat basis than steaks from the posterior halves. Analyses of a limited number of coho steaks indicated that they were lower in PCB and DDT compounds than the chinook steaks but showed no consistent pattern of reduction due to cooking methods. (Author abstract by permission)

73-2595. Hart, H. V.; Willis, K. H. (Author address not given). **Pesticide and mercury residues in wheat.** *J. Flour Anim. Feed Mill. 155(4): 38, 40; 1973.* (2 references)

In a survey conducted by the laboratories of the Flour Milling and Baking Research Association in 1970, wheat sampled at the British mills contained pesticide residues below established or proposed tolerances in most cases. A single sample of Bulgarian wheat contained the highest residue (0.081 ppm) of α- plus γ-BHC, and U. S. wheat contained the lowest residues (0.003 ppm) of these isomers. Both were well below the FAO/WHO recommended tolerance of 0.5 ppm for lindane. Residues for DDT did not exceed the 0.03 ppm proposed tolerance limit in most of the 104 samples although some Russian wheat contained 0.03 ppm. Canadian wheat contained, on an average, 0.001 ppm DDT. Dichlorvos was detected in only a few of the samples and at levels of from 0.01 to 0.04 ppm. Malathion was frequently found, and levels exceeded the recommended tolerance of 8 ppm in 75% of the Australian samples. Mercury residues ranged from 0.002 to 0.007 ppm, much lower than the 0.05 ppm suggested tolerance.

73-2596. Kovaleva, Ye. S.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Sanit., USSR). **Absorptsiya DDT iz pochvy i yego translokatsiya v stebli i list'ya rasteniy. [Absorption of DDT from the soil, and its translocation in plant stems and leaves.]** *Khim. Sel. Khoz. 10(8): 586-589; 1972.* (10 references) (Russian)

The translocation and metabolism of DDT were studied in stems, leaves, and fruits of potato, corn, sugar beet, cattle turnip, vetch, and oat plants. The above plants absorbed DDT from sandy soils, especially during the July and August period of intense growth. Following the application of 3 kg of DDT per ha in early June, the DDT residue levels in cornhusks, potato skin, turnip and sugar beet roots, as well as in stems of vetch and oats at harvesting in September were 0.046, 0.026, 0.206, 0.574, 0.148, and 0.135 mg/kg, respectively. No metabolism of DDT to DDE was observed in corn, beet, turnip, oats, potato, and vetch. The elevated DDD (TDE) levels found in corn and potato plants, as compared to the original pesticide preparation, are most likely due to the conversion of *p,p'*-DDT into *p,p'*-DDD in the soil or in the plant.

73-2597. Abbasov, T. A. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Ostatki fosfororganicheskikh insektitsidov v rasteniyakh klevera i kartofelya. [Organophosphorus insecticide residues in clover and potato plants .]** *Khim. Sel. Khoz. 10(8): 597-598; 1972.* (Russian)

Trichlorfon, phosphamide (dimethoate), trichlorometaphos-3 (ronnel), and methylnitrophos (fenitrothion) residues were determined in clover and potato plants by thin-layer chromatography after application of 2 kg/ha doses. The elimination of trichlorfon, trichlorometaphos-3, phosphamide, and methylnitrophos from clover was complete in 15, 20, 20, and 17 days after application. The trichlorfon, phosphamide, methylnitrophos, and trichlorometaphos-3 residues in dried hay mown two days after pesticide application persisted up to 10, 8-10, 15, and 18 days, respectively. Trichlorfon, phosphamide, trichlorometaphos-3, and methylnitrophos were detected in potato tops during the first 10-12, 8-10, 13, and 17 days after application. Potato tubers did not contain insecticide residues.

73-2598. Motuzinskiy, N. F.; Sannikov, G. P.; Fedorova, L. N. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic. Polymers and Plastic Materials, Kiev, USSR). **Ostatki fenurona v raznykh sredakh. [Fenuron residues in various media.]** *Khim. Sel Khoz. 10(9): 689-693; 1972.* (15 references) (Russian)

Fenuron residues were determined by chromatography in soil, grass, water, and animals at various intervals after aerial and manual application of fenuron at a rate of 50 kg/ha. Fenuron residue levels in water samples taken from the upper 15 cm water layer of irrigation canals in the treated area decreased from 0.15-0.28 mg/l. during the week after application to 0.05 mg/l. in 12 months. The corresponding residue levels in the 60-90 cm water layer were 0.01 mg/l. in the first week and 0.0-0.01 mg/l. 12 months later. The residue contents in the upper 10 cm soil layer decreased from 23.4 mg/kg to 0.045 mg/kg six months after aerial application. Fenuron gradually penetrated into deep-lying soil layers to reach the 130-140 cm layer in six months although soil samples taken 12 months after fenuron application did not contain fenuron residues. The fenuron level in the upper 10 cm soil layer decreased from 50 mg/kg to 0.0075 mg/kg 12 months after manual application. Fenuron residues in grass collected 1, 5, 10, and 30 days after application were 2, 1.6, 0.06, and 0.04 mg/kg. Grass samples did not contain fenuron two months after application. Fenuron residue contents in earthworms decreased from 1.3 mg/kg after five days to 0.02 mg/kg after one month. Rodents from wooded areas did not contain fenuron residues.

73-2599. Nalbandyan, R. A. (Azerbaidzhan Sci. Res. Inst. Plant Protection, USSR). **Dinamika ostatkov rogora na vinogradnoy loze. [Dynamics of rogor residues on grape vines.]** *Khim. Sel. Khoz. 10(12): 915-916; 1972.* (3 references) (Russian)

The residue dynamics of rogor (dimethoate) were studied in leaves, flowers, and fruits of grape vines, and in grass and soil in rogor-treated vineyards. Sprayings with 0.2% emulsion of rogor were conducted in early and late May and in early June. Rogor concentrations determined by colorimetry in grape leaves, flowers, and stems, and in grass one day after the first spraying were 1.73-2.40, 1.28-1.75, 0.86-1.61, and 0.65-0.7 mg/kg. The corresponding values obtained one week later were

0.35-0.55, 0.16-0.46, 0.1-0.33, and 0.08-0.35 mg/kg, respectively. Elimination of the residues was completed in 14-15 days. Residues persisted for 25 to 35 days after a second spraying without exceeding 0.13 mg/kg. Riesling grapes contained rogor residues well below the maximum allowable concentration of 1.5 mg/kg. One day after sprayings in late June and late July the rogor residues in leaves, grapes, stems, and grass were 1.91-2.25, 1.48-1.73, 1.38-1.65, and 0.77-0.86 mg/kg. Grapes contained only traces of rogor 30-31 days following treatment. The rogor concentrations in the upper 20 cm-layer of the soil ranged from 0.82 to 0.1 mg/kg on the days following each pesticide application and decreased to negligible amounts in the upper soil layer in 5-7 days.

73-2600. Kutuzov, G. P.; Chernyayev, N. G. (All-Union Sci. Res. Inst. Fodder, USSR). **Primeneniye gerbitsidov na posevakh bryukvy, turnepsa i kormovoy kapusty. [The use of herbicides on plantings of turnips, rutabaga, and fodder cabbage.]** *Khim. Sel. Khoz. 11(3): 216-220; 1973.* (15 references) (Russian)

The efficiency of semeron (desmetryne), ramrod (propachlor), trifluralin, and TOK (nitrofen) used for weed control in plantings of turnips, rutabaga, and fodder cabbage, and semeron residues occurring in these plants and in soil were studied. Semeron was applied for fodder cabbage, rutabaga, and turnips at 0.7 kg/ha. Residue contents measured in fodder cabbage, turnips, and rutabaga three weeks after application were 0.015, 0.020, and 0.010 mg/100 g of dry matter. Soil samples contained only traces of semeron at the same time. Fodder cabbage, turnips, and rutabaga did not contain semeron residues five weeks after application, and semeron traces were not detected in soil four weeks after application.

73-2601. Noguchi, T.; Tsuji, I . (Dept. of Physics and Chem., Kumamoto Prefect. Inst. for Pub. Health, Kumamoto, Japan). **[Studies on the pesticide residues in foods. Report 1. On the status of organochlorine pesticide residue in fatty foods and on the behavior of their products of photolysis.]** *Kumamoto-Ken Eisei Kenkyu Shoho (Annu. Rep. Kumamoto Prefect. Inst. Pub. Health) 102-118; 1970.* (5 references) (Japanese)

Organochlorine pesticide residues were analyzed in six samples of raw milk, 15 samples of commercial milk, and 10 samples of human milk (fatty foods). Pesticide residues were also determined in nine samples of green tea, seven samples of cucumber, and six samples of Japanese radish (non-fatty foods). Dieldrin was detected in all the fatty foods ranging from trace to 0.013 ppm; nine samples of mothers' milk, two of raw milk, and eight of commercial milk had residue levels exceeding WHO's accepted level. In vegetables and fruits dieldrin was detected only on cucumber at 0-0.016 ppm. Aldrin was undetectable in all samples. Endrin was detected in raw milk in amounts ranging from trace to 0.005 ppm, in one sample of cucumber (0.011 ppm), and in two samples of Japanese radish top (max 0.086 ppm). Total DDT was detected in all fatty foods (0.002-0.183 ppm). DDT content was far lower than the standard and ranged from trace-0.074 ppm in vegetables and fruits except cucumber. Total BHC was detected in all fatty foods (0.064-0.587 ppm) and in all vegetables and fruits (0.004-0.0665 ppm). No sample contained more than 0.5 ppm of γ-BHC (lindane); β-BHC ranged from 0.038-0.576 ppm in fatty foods, and 0.002-0.150 ppm in fruits and vegetables. The most highly polluted food was mothers' milk, the degree being higher in urban than in rural women. The daily intake of pesticides in mother's milk calculated from the data could be harmful to infants.

73-2602. Richou-Bac, L. (Lab. Cent. Rech. Vet. Alfort, Maisons-Alfort, France). **Etat actuel de la pollution du lait et des produits laitiers par les residus de composes organo-chlores. [Current status of pollution of milk and dairy products by organochlorine compounds.]** *Lait 53 (523-524): 117-136; 1973.* (16 references) (French)

A survey of organochlorine residues in French milk and dairy products from 1967 to 1971 showed that dieldrin and heptachlor epoxide increased from 0.02 to 0.10 ppm. The residues stem from commercial feed mixtures and cow-forage. BHC residues have been declining and totaled 0.29 ppm in 1971. Generally, aldrin, heptachlor, methoxychlor, and DDT or its metabolites were not detected, and polychlorinated biphenyls and anthelmintic residues were not found in control samples. Possible long-term toxicity of organochlorine residues, particularly effects on the liver and the endocrine system, have prompted the establishment of acceptable daily intake values. Residues found in this study were within the present standards, and new regulations regarding use of pesticides and allowable levels in foodstuffs should provide a solution to the problems created by pollution of milk products by organochlorine compounds.

73-2603. Bellan, G.; Peres, J. M. (Sta. Mar. d'Endoume et Cent. d'Oceanogr., Fac. Sci. Marseille, 13 Marseille, France). **La pollution dans le Bassin Mediterraneen (quelques aspects en Mediterranee nord-occidentale et en haute Adriatique: leurs enseignements). [Pollution in the Mediterranean basin (some aspects in the north-western Mediterranean and the upper Adriatic: their lessons).]** *IN: Marine Pollution and Sea Life, Fishing News (Books) Ltd., London, 1972, pp. 32-35.* (14 references) (French)

The Mediterranean, a closed sea surrounded by industrialized countries with increasing mass tourism, is receiving quantities of untreated waste which the "self-cleansing properties of sea water" can no longer be expected to handle. Detailed pollution analyses have been conducted in the regions of Marseille and Trieste.

Problems in Trieste are primarily due to bacteriological and industrial contamination. Pesticide concentrations were measured in the water of the Bay of Marseille. At the outlet of a small coastal river, 21 ppt (parts per trillion) *o,p'*-DDT were measured in the seawater, as well as 18 ppt *p,p'*-DDT, 17 ppt lindane, and 16 ppt aldrin. The concentrations had varied only slightly one mile to the west, and at three miles away, values of 16 ppt *o,p'*-DDT and 12 ppt *p,p'*-DDT were found.

73-2604. Mori, Y.; Ito, K.; Sakurai, K.; Mori, M.; Sudo, T. (Section of Physics and Chemistry, Mie Prefect. Inst. of Pub. Health, Tsu, Japan). **[On the results of investigation of milk-pollution by pesticide residues.]** *Mie-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Mie Prefect. Inst. Pub. Health) 18: 59-68; 1971.* (5 references) (Japanese)

The results of determining pesticide residues in milk were published. Eighty percent of 97 samples of commercial milk collected and analyzed for major organochlorine pesticide residues from Aug. 1970 to March 1972 contained less than 0.05 ppm. Only 2% contained over 0.2 of β-BHC, and more than 50% contained less than 0.05 ppm of total BHC. Ninety percent of the samples contained 0.001-0.005 ppm of dieldrin plus aldrin; however, six percent of the samples contained more than the standard limit of 0.005 ppm of dieldrin plus aldrin. Endrin was not detected. The amount of each BHC isomer was highest in either October or December 1970. Total BHC also peaked in December with an average value of 0.112 ppm. Generally, the amount of each isomer and total BHC gradually decreased with time as shown in the average values for August 1970 and March 1971: α-BHC 0.022-0.004, β-BHC 0.050-0.013, γ-BHC 0.010-0.001, δ-BHC 0.004-0.001, and total BHC 0.086-0.019. Total DDT peaked twice: 0.022 ppm in July 1971 and 0.018 ppm in January 1972. However, the average values were 0.012-0.005 ppm. Dieldrin was highest in June 1971, with 0.008 ppm; a time related decrease was not noticeable.

73-2605. Ban, Y.; Yoshida, K.; Nishikawa, M.; Baba, G.; Kawaguchi, Y.; Tanaka, H. (Sect. Hyg. Chem., Nagasaki Prefect. Hyg. Lab., Nagasaki, Japan). **[On the results of investigation of pesticide residues in foods. II.]** *Nagasaki-Ken Eisei Kenkyu Nenpo (Annu. Rep. Nagasaki Prefect. Hyg. Lab.) 11: 40-41; 1971.* (Japanese)

Residues of α-, β-, γ-, and δ-BHC, *p,p'*-DDT, *p,p'*-DDD, *p,p'*-DDE, dieldrin, and endrin in several kinds of foods such as grapes, peanuts, beef, pork, chicken, cows' milk, and human milk collected in Nagasaki Prefecture were published. Total residues of BHC were largest in beef, followed by pork, then chicken: 1.888-0.086, 0.068-0.015, and 0.033-0.007 ppm. The higher the fat content the higher the residue. Total residues of DDT were highest in pork, followed by chicken meat, and by beef: 0.069-0.011, 0.030-0.002, and 0.031-0.001 ppm. Dieldrin residues were highest in beef, followed by pork and chicken and quite high in peanuts. BHC residues in commercial milk gradually decreased from 0.251 to 0.103 ppm. Such decreases in DDT and dieldrin were not found. Aldrin and endrin were undetectable in all milk specimens. Of pesticide residues in human milk BHC was highest in city residents, followed by rural residents and by farming and fishing homes; DDT was highest in rural inhabitants followed by farming and fishing homes and city residents. When compared to the results of last year's investigation, BHC residues were half of the city, and 8/9 of the rural values; DDT residues were 2/3 of last year's in city residents and increased in rural districts. No difference was found in dieldrin.

73-2606. Baba, K.; Yoshida, K.; Nishikawa, M.; Kawaguchi, Y.; Tanaka, H. (Sect. Hyg. Chem., Nagasaki Prefect. Hyg. Lab., Nagasaki, Japan). **[On the result of investigation of pesticide residues in daily diets.]** *Nagasaki-Ken Eisei Kenkyu Nenpo (Annu. Rep. Nagasaki Prefect. Hyg. Lab.)11: 42-45; 1971.* (Japanese)

The intake of pesticide residues in daily diets was investigated in May and Nov. 1971, in Nagasaki Prefecture. One day's cooked diet was blended and a 100 g aliquot analyzed. Target pesticides were α-, β-, γ-, and δ-BHC, total DDT, and dieldrin. The uptake of total BHC was higher in heavy milk drinkers (25-127 μg/day; 54.7 μg/day average) than in those who drank little (3.1-38.5 μg/day; 17.5 μg/day average). When the highest uptakes of γ-BHC and DDT were compared to the ADI of WHO/FAO, the former was 1/54 and the latter 3/5 in adults. The uptake of dieldrin was nearly the same as the ADI in the highest instances but the average intake was 1/5 of the ADI. When the uptake of γ-BHC and dieldrin was calculated per kg body weight, there was no difference between the values of inhabitants of Nagasaki and those of Europe and the U. S. However, the intake of DDT per kg by the inhabitants of Nagasaki was about 2.5 times larger than those of Europe and the U.S. The intake of γ-BHC was relatively higher in children than in adults.

73-2607. Kiriyama, C.; Ichikawa, H. (Nara Prefect. Inst. Pub. Health, Nara, Japan). **[On the result of determination of pesticide (BHC) residues in dairy products.]** *Nara-Ken Eisei Kenkyu Shoho (Annu. Rep. Nara Prefect. Inst. Pub. Health) 6: 47-51; 1971.* (Japanese)

BHC residues were determined in 64 samples of commercial milk from April 1971 to Feb. 1972. The average contents of α-, β-, γ- and δ-BHC were 0.017, 0.061, 0.003 ppm and trace in April 1971; 0.013, 0.039, 0.001, and 0.001 ppm in June 1971; 0.027, 0.066, 0.003 and 0.003 ppm in Aug. 1971; 0.015, 0.054, trace, and 0.001 ppm in Oct. 1971; and 0.007, 0.025, trace, and trace in Feb. 1972. The noticeable decrease of BHC in Feb. 1972 is attributed to the ban on BHC and the

ban on feeding BHC-treated rice straw to cows. BHC residues in adipose tissue of dairy cattle are still high; 0.538 ppm of α-, 1.931 ppm of β-, 0.057 ppm of γ- and 0.061 ppm of δ-BHC; also, 0.104 ppm of *p,p'*-DDT, 0.141 ppm of *p,p'*-DDE and 0.052 ppm of dieldrin have been found. Monitoring of residues in milk should continue.

73-2608. Cox, J. L. (Southeast. Massachusetts Univ., N. Dartmouth, MA 02747). **DDT residues in marine phytoplankton.** *Residue Rev. 44: 23-38; 1972.* (38 references)

In natural marine phytoplankton populations, virtually all of the DDT residues available for uptake are incorporated into phytoplankton cells and similarly-sized detrital particles, but this may only represent a small percentage (10%) of the DDT residues recoverable from whole seawater. Samples of particulate material collected by continuous flow centrifugation from coastal waters in the California Current contain about 2×10^{-6} g of DDT residues/g of carbon. Samples collected by a net which contain mostly phytoplankton cells have about 15 times this concentration. The difference may be accounted for by the presence of non-DDT-bearing particulate organic carbon present in the samples collected by centrifugation. Photosynthesis begins to be inhibited in most phytoplankton species at concentrations in excess of 1×10^{-9} g of DDT/ml medium. The effect of DDT on cellular division in marine phytoplankton is probably due to its effect on photosynthesis. Concentrations of DDT required to cause significant lags in cell division rates are much higher than concentrations required to inhibit short-term photosynthesis. The cause of this toxic effect of DDT is not known, but it may be due to interference with photosynthetic electron transport. However, this toxic effect does not appear to have ecological significance. Prevailing levels of DDT in coastal seawater are at least 10^{-3} times less than concentrations required to produce photosynthetic inhibition in pure cultures of marine phytoplankton. The significance of DDT residues in marine phytoplankton is related to transfer of DDT to higher trophic levels and sedimentation of DDT residues with detritus of phytoplanktonic origin. (Author abstract by permission, abridged)

73-2609. Kenaga, E. E. (Dow Chem. Co., Midland, MI 48640). **Guidelines for environmental study of pesticides: determination of bioconcentration potential.** *Residue Rev. 44: 73-113; 1972.* (63 references)

Molecules such as DDT and its stable transformation products persist and become bioconcentrated. The degree of bioconcentration depends on the temporary equilibrium of residue concentration reached initially by adsorption on organisms in competition with the air, water, and soil segments of the environment, and redistribution of these adsorbed pesticides in organisms and their tissues by ingestion, absorption, metabolism, partitioning, storage, and elimination. Some of the important criteria for selecting methods to measure bioconcentration discussed are the physical, chemical, and biochemical properties of the pesticide and its transformation products; surface-weight relationship of treated environmental objects; and consumption rates of various organisms. Bioconcentration factors are highly variable due to great variation in the parameters and test methods used for measurement and calculation of the factors. Standardization of environmental test methods is needed for comparative purposes. Serious ecological problems may arise from bioconcentration when the degree of partitioning of a substance or its transformation products from water results in translocation to and storage in critical tissues of the organisms. Bioconcentration in many species can result in high residues caused by constant exposure to widely distributed toxicants, and an intake exceeding the capacities of the organisms to metabolize and eliminate them. Some of the important properties of pesticides resulting in high bioaccumulation are low water solubility, high fat solubility, high partitioning coefficients from water to environmental components, and high stability under various hydrolytic, light, heat, and microbiological conditions. (Author abstact by permission, abridged)

73-2610. Paris, D. F.; Lewis, D. L. (EPA, Nat. Environ. Res. Cent., Corvallis; Southeast Water Lab., Athens, GA 30601). **Chemical and microbial degradation of ten selected pesticides in aquatic systems.** *Residue Rev. 45: 95-124; 1973.* (157 references)

This literature search documents the extent of knowledge of the degradation of ten materials (atrazine, captan, carbaryl, diazinon, 2,4-DB, malathion, methoxychlor, parathion, polychlorinated biphenyls, and toxaphene) in aquatic systems. The fragmentary nature of this picture is illustrated by the fact that degradation products have not been reported for toxaphene or PCBs. Photochemical degradation products have been identified for only seven of the ten materials; reactions of eight of the compounds have been studied as a function of pH, but no rate constants are given for the reactions; and although microbial degradation of nine pesticides has been studied, only 2,4-DB has been studied in detail. It is the only compound for which microbial kinetics have been measured. Ability to predict the fate and ecological effect of pesticides on aquatic systems is vitally dependent upon the availability of accurate rates and products of degradation. Quantitative models to predict the fate and ecological effect of pesticides are vitally dependent on identification of products and rate for each possible pathway. Consequently, the importance of trying more accurately to quantify such rates cannot be overemphasized. (Author abstract by permission, abridged)

73-2611. Kaemmerer, K.; Buntenkoetter, S. (Inst. Pharmacol., Toxicol., and Pharm. of the Tieraerztliche

Hochschule, Hanover, Germany). **The problem of residues in meat of edible domestic animals after application or intake of organophosphate esters.** *Residue Rev. 46: 1-240; 1973.* (656 references)

The risk of acute toxic manifestations developing in man due to the ingestion of meat containing organophosphate residues is not great. The animal treated with organophosphates as parasiticides or ingesting the residues in feed serves as the first line of detoxication and the indicator of toxic levels. Measurable organophosphate residues may nevertheless be present in animal flesh at the time of slaughter; implications, legislation, and analytical considerations relating to such residues are reviewed. Following the general consideration, literature reports presenting residue data for 45 organophosphates are reviewed. Metabolism and toxicity information is also included for these compounds since these factors naturally affect the residue levels found.

73-2612. Hayashi, M. (Dept. Hyg. for Mothers and Children, Nat. Inst. Pub. Health, Tokyo, Japan). **[Pollution of mothers' milk by organochlorine compounds.]** *Shonika (Pediatrics) 14(7): 527-531; 1973.* (17 references) (Japanese)

A report that β-BHC was detected in all samples of breast milk in Akita Prefecture prompted the Ministry of Health and Welfare to investigate the state and the route of pollution. The results of the determination on 454 samples from 24 prefectures (Jan. to March, 1971) one to four months after parturition showed that BHC, DDT, and dieldrin were detected in 100, 100, and 79% of the total samples with average contents of 0.003 ppm of α-, 0.1196 ppm of β-, 0.0026 ppm of γ-, and 0.0008 ppm of δ-BHC, 0.0607 ppm of DDT, and 0.0037 ppm of dieldrin. During a second investigation of 398 samples from 38 prefectures (Nov. 1971 to Feb. 1972) BHC and DDT were detected in 100% of the samples and dieldrin and heptachlor in 75% and 14%, respectively, with 0.1009 ppm of β-BHC, 0.0626 ppm of DDT, and 0.0034 ppm of dieldrin. On the average, β-BHC and dieldrin decreased by 15%, however, DDT remained unchanged. Pollution of breast milk by β-BHC was extremely high in comparison to other countries. In Japan, the β-BHC content is higher in western areas than in eastern areas, reflecting the greater use of BHC insecticides. The route of β-BHC contamination was through applications on paddy field, translocation via the rice straw, and contamination and pollution of dairy cattle and cow milk. This accounts for highest values in urban women who consume four and two times more beef and milk than rural women. β-BHC persisted in the body without degrading; 11.37 ppm was found in the omentum majus of 74 patients. Although no cases of chronic intoxication in humans have occurred monkeys administered 12 mg/kg of β-BHC p.o. for three months showed inhibition of body weight gain, hypertrophy of liver, decreased blood albumin, and increased urea nitrogen and free cholesterol. However, detailed clinical examinations of mothers and children showed no differences between groups secreting highly polluted milk (BHC, DDT, and dieldrin) and those secreting not so highly polluted milk. Transplacental migration of organochlorine compounds has also been shown. β-BHC and PCB fed for 24 weeks at levels of 100 and 250 ppm did not induce hepatomas in the mouse although combined administration of 100 ppm of β-BHC and 250 ppm of PCB did induce hepatoma. In Japan the ADI is temporarily 50 μg/kg/day. Pregnant women or nursing mothers should restrict their intakes of food containing large amounts of DDT and BHC.

73-2613. Hara, A.; Yoshioka, Y.; Nawa, H.; Iwasaki, I.; Yokoo, S. (Prof. Hiraki's Sch. Intern. Med., Fac. of Med., Okayama Univ., Okayama, Japan). **[On the organochlorine pesticide residues in the blood of pregnant women and in umbilical cord blood.]** *Sogo Rinsho (Clin. All-Round) 22(8):1693-1698; 1973.* (30 references) (Japanese)

Organochlorine pesticide residues including α-, β-, and γ-BHC, dieldrin, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE, and *p,p'*-DDD (TDE) were determined in the blood of pregnant women and in umbilical cord blood by extracting the serum with *n*-hexane and then using gas chromatography with ECD. Dieldrin was detected in about half of the samples; other organochlorine pesticide residues were detected in all of the samples. The amounts of total BHC and total DDT in pregnant women's serum were about two times those in non-pregnant women; that of dieldrin was about five times greater than that in non-pregnant women. The values in the serum from umbilical cords were about the same as those in the serum of a normal adult. About 85% of total BHC in the serum of pregnant women was β-BHC, and about 60% of total BHC in the serum from umbilical cords was β-BHC. The amount of α-BHC in the serum of umbilical cords was about twice that in the mothers' blood serum. The amounts of *p,p'*-DDT and *o,p'*-DDT were similar. From these findings it was concluded that two thirds of total DDT and total BHC in the mother's body travels to the fetus, and about one third of the DDT in the mother's body goes to the fetus. The effects of these residues and their translocation to the fetus via placenta are discussed with reference to the literature.

73-2614. Braud, J. P. (Station Marine Endoume, 13 - Marseille 7e, France). **Etude de la fixation et de la concentration des insecticides organochlores par les algues pluricellulaires de l'Etang de Berre. [Study of the fixation and concentration of organochlorine insecticides by multicellular algae from Etang de Berre.]** *Tethys 4(1): 41-50; 1972.* (8 references) (French)

Benthic algae analyzed for organochlorine pesticides from seven locations around l'Etang de Berre (Berre Pond) contained only α- and γ-BHC. Since both of these isomers and, in addition, δ-BHC at five

locations, were found in the water, the algae apparently metabolize δ-BHC rapidly or do not absorb it. Although water at two stations contained DDE, none was detected in algae. At the location where DDT was detected in algae, the pesticide was not present in the water, suggesting that the residue was due to past pollution. Approximate mean concentration factors for α-BHC and δ-BHC were 38 and 16, respectively. The major source of organochlorine pollution appeared to be the Durance outfall at St. Chamas.

73-2615. Schultz, D. P. (Southeastern Fish Control Lab., Bureau of Sport Fish. and Wildl., U.S. Dept. Interior, Warm Springs, GA 31830). **Uptake and dissipation of the dimethylamine salt of (2,4-dichlorophenoxy)acetic acid in fish, water, and hydrosol.** *Final Rep. Res. Proj., Div. Fish. Res., Bur. Sport Fish. Wildl., U. S. Dep. Interior, Washington, DC 20240, 1973, 67p.* (29 references)

Pools of water were sprayed with the dimethylamine salt of 2,4-D at rates of 2.24, 4.48, or 8.96 kg/ha. Residues declined to less than 0.005 mg/l. in some ponds by the 28th day and by the 56th day in others. The highest hydrosol residue was 0.170 mg/kg, found in 1 and 3 day samples from a pond treated at 8.96 kg/ha. No fish kill was noted. Of 303 fish samples, 45 contained detectable 2,4-D residues. One sample contained more than 1.0 mg/kg; 3 contained 0.10 to 0.49 mg/kg; 4 contained 0.050 to 0.099 mg/kg; 21 contained 0.010 to 0.049 mg/kg; and 16 contained less than 0.010 mg/kg. Additional fish were exposed in the lab to 0.5, 1.0, or 2.0 mg/l. of the dimethylamine salt of ^{14}C-2,4-D for up to 84 days. Radioactive residues of 2,4-D were found in eight or more tissues and organs. However, the actual 2,4-D content was negligible in muscle, indicating that most of the ^{14}C-residue was a metabolite of 2,4-D.

73-2616. Clay, D. V.; Stott, K. G. (Agr. Res. Counc., Weed Res. Org., Begbroke Hill, Yarnton, Oxford OX5 1PF, England). **The persistence and penetration of large doses of simazine in uncropped soil.** *Weed Res. 13(1): 42-50; 1973.* (18 references)

The residues remaining in the soil from repeated annual application of simazine at 2.8, 5.6, and 22.4 kg/ha to uncropped plots on a loam soil were measured by chemical or bioassay methods at various intervals after treatment. The total simazine residue present 12 months after the last of three treatments with 2.8 kg/ha and eight months after the last of five treatments with 5.6 kg/ha was less than 10% of the annual dose. This rapid decomposition is considered consistent with the soil and climatic conditions. In contrast a much larger residue (a mean value of 1.7 kg/ha) was found on plots sampled two and a half years after the last of two annual applications of simazine at 22.4 kg/ha and the reduction in the amount of residue during the next twelve months was only of the order of 25%. In all treatments the highest concentration of simazine was found in the surface layers of the soil but measurable residues were detected to 60 cm depth, three and a half years after the last 22.4 kg/ha application. There was considerable variation in the total residues recovered between replicate plots and between different positions on the same plots in all treatments regardless of the depth of the sample. The possible causes of this variation are discussed. (Author abstract by permission)

73-2617. Grover, R. (Res. Sta., Can. Dept. Agr., Regina, Saskatchewan, Canada). **The adsorptive behaviour of acid and ester forms of 2,4-D on soils.** *Weed Res. 13(1): 51-58; 1973.* (23 references)

The adsorption of acid, *n*-butyl, and iso-octyl ester forms of 2,4-D (2,4-dichlorophenoxyacetic acid) was studied for several Canadian prairie soils. The *k* values for the acid ranged from 0.09 to 1.30 and were correlated to the soil organic matter and not to the clay content. The *Q* values (μg adsorbed/g of organic matter) for the acid were 7.2 ± 1. The *n*-butyl and the iso-octyl esters hydrolyzed to the acid form in the aqueous medium and this process was accelerated in the presence of the moist soil. Consequently, the *k* values for the esters, using slurry type adsorption experiments, or their distribution coefficients, using leaching columns, could not be determined. It was concluded that the adsorptive behavior of the two esters in moist soil was similar to that of the acid form. (Author abstract by permission)

73-2618. Burns, I. G.; Hayes, M. H. B*.; Stacey, M. (Dept. Chem., Univ. Birmingham, Birmingham B15 2TT, England). **Some physico-chemical interactions of paraquat with soil organic materials and model compounds. I. Effects of temperature, time and adsorbate degradation on paraquat adsorption.** *Weed Res. 13(1): 67-78; 1973.* (37 references)

Some investigations were carried out on the adsorption of paraquat by a range of organic materials which included an organic soil, various humic fractions from that soil, model polymers prepared by the oxidative coupling of benzoquinone, the ion exchange resins Zeo-Karb 216 and 226, and Amberlite XAD-2. The time required for the adsorption process to reach equilibrium ranged from about 3 h (for the soil and humic preparations) to about 48 h (for the more highly cross-linked materials). Adsorption by Amberlite XAD-2, a cross-linked polystyrene resin, was very small, presumably because it lacked ion-exchange sites. The results suggested that particle diffusion control was operating and the different equilibrium times reflected different degrees of molecular complexity within the adsorbents. Temperature, within the 20°-70°C range, did not affect the adsorption equilibrium, and this is indirect evidence for ion exchange as the primary adsorption mechanism. No evidence was found for decomposition

of paraquat in the adsorption systems studied. (Author abstract by permission)

73-2619. Burns, I. G.; Hayes, M. H. B.*; Stacey, M. (Dept. Chem., Univ. Birmingham, Birmingham B15 2TT, England). **Some physico-chemical interactions of paraquat with soil organic materials and model compounds. II. Adsorption and desorption equilibria in aqueous suspensions.** *Weed Res. 13(1): 79-90; 1973.* (26 references)

The adsorption equilibria of paraquat were investigated on a range of organic materials including an organic soil, various humic fractions of that soil, model polymers prepared by the oxidative coupling of benzoquinone, ion-exchange resins (Zeo-Karb 216 and 226) and a polystyrene resin (Amberlite XAD-2). Isotherms were prepared for adsorption on the H^+ and on some of the Ca^{2+} saturated materials. Measurement of the counter-ion in solution at equilibrium, and correlation of the adsorption with exchange capacity for H^+ adsorbents showed that ion exchange was the primary adsorption mechanism. Significant amounts of non-exchange adsorption were also detected, especially at low concentrations, but generally the results followed the Rothmund-Kornfeld isotherm equation fairly accurately. The Rothmund-Kornfeld plots for the Ca^{2+} forms were complicated by the hydrolysis by water of some of the exchange sites. Other types of isotherm equations were tested and found to be unsatisfactory. Desorption of paraquat with HCl from organic soil preparations was less than expected, and the isotherms did not conform to the Rothmund-Kornfeld or to the mass action equations. The probable reasons for this behavior are discussed. (Author abstract by permission)

73-2620. Yamanashi Prefect. Inst. for Pub. Health (Yamanashi, Japan). **[Results of investigation of pesticide residues in fruits and vegetables.]** *Yamanashi Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Yamanashi Prefect. Inst. Pub. Health) 15: 17-18, 1972.* (Japanese)

Pesticide residues were determined in three samples of summer orange, five samples of strawberry, six samples of cucumber, five samples of tomato, eight samples of peach, seven samples of grape, and three samples of potato. As_2O_3 residues ranged from 0.30-0.05 ppm in summer oranges, 0.12-0.05 in strawberries, 0.15-no trace in cucumbers, 0.10-no trace in tomatoes, 0.35-0.05 in peach, 0.45-0.10 in grapes, and 0.150-0.100 ppm in potatoes. Lead residues ranged from 0.354-0.072, 0.060-0.040, 0.122-0.063, 0.091-0.079, 0.251-0.112, 0.251-0.125, and 0.250-0.175 ppm in the same order of fruits and vegetables. In only one sample of potato was dieldrin detected (0.007 ppm). All organochlorine pesticide residues were less than 0.001 ppm except γ-BHC (lindane). Generally speaking, the amount of pesticide residues decreased noticeably compared to those at the beginning of the regulation of pesticide use.

73-2621. Yamanashi Prefect. Inst. Pub. Health (Yamanashi, Japan). **[Results of investigation of cow milk-pollution by organchlorine pesticide residues.]** *Yamanashi Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Yamanashi Prefect. Inst. Pub. Health) 15: 18-20; 1972.* (Japanese)

Organochlorine pesticide residues were determined in 24 samples of commercial cow's milk. The average fat and pesticide residue contents in commercial milk were 3.09% fat, and 0.0073 ppm α-BHC, 0.0117 ppm β-BHC, 0.0005 ppm γ-BHC, no detectable δ-BHC, 0.0039 ppm dieldrin, and no detectable DDT at the first investigation; 3.07%, 0.0093 ppm, 0.104, 0.001, not determined, 0.0041 ppm, and not determined in the second investigation; 3.03%, 0.0060 ppm, 0.0100, 0.0008, not determined, 0.0011, and 0.0029 ppm in the third investigation; and 3.09% and 0.0038 ppm, 0.0042, 0.0006, 0.0003, 0.0015 and 0.0015 ppm in the last investigation. In raw milk, the fat content was 3.17-4.79% and pesticide residues were greater.

73-2622. Yamanashi Prefect. Inst. Pub. Health (Yamanashi, Japan). **[Result of the investigation of mothers' milk pollution by organochlorine pesticides.]** *Yamanashi Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Yamanashi Prefect. Inst. Pub. Health) 15:20; 1972.* (Japanese)

Organochlorine pesticide residues were determined in five samples of breast milk from rural districts and in five samples from city districts. α-, β-, γ-BHC, *p,p'*-DDT, *p,p'*-DDE, dieldrin, and heptachlor epoxide in milk from rural-dwellers ranged from 0.002-0.001, 0.077-0.019, 0.002-0.001, 0.053-0.010, 0.002-nd, 0.004-0.002 and 0.004-0.001 ppm; that from urban women ranged from 0.002-0.001, 0.069-0.015, 0.004-0.001, 0.077-0.007, 0.002-nd, 0.005-0.001 and 0.001-nd. Delta-BHC, *p,p'*-DDD, *o,p'*-DDT, aldrin, endrin, and heptachlor were not detected. When compared to the results of an investigation by the Ministry in 1970, the pollution of breast milk by organochlorines is considered slight.

73-2623. Fukazawa, Y.; Amino, H. (Yamanashi Prefect. Inst. Pub. Health, Yamanashi, Japan). **[On the investigation of pesticide residues (BHC) in raw and commercial cow milk. Part III.]** *Yamanashi Kenritsu Eisei Kenkyusho Nenpo (Annu. Rep. Yamanashi Prefect. Inst. Pub. Health) 15: 71-73; 1972.* (6 references) (Japanese)

In raw milk samples from three dairy districts in the prefecture BHC residues decreased from 0.035 to 0.015, 0.042 to 0.025, and 0.163 to 0.015 ppm in 18 months. BHC residues, were investigated in rice straw harvested in 1969; however, the average content was 0.117 (α-BHC 0.033, β- 0.058 and γ- 0.026) ppm. A comparison of BHC residues in milk fat with mesenteric fat revealed only small differences between them, the former being 4.215 (α-BHC 1.589, β- 2.522 and γ- 0.104) and the latter being 3.990 (α-BHC 1.530, β- 2.390 and γ- 0.070) ppm. Specimens of commercial milk were

divided into three groups, the first encompassing the season of change in feed from rice straw to greens, the second in the midst of green feeding, and the third in the season when only straw is fed. Total BHC decreased to 1/20 in two years, β-isomer showing the largest decrease to 1/30 followed by δ-isomer and α-isomer. Dieldrin residues also decreased (0.010 to 0.0015 ppm). The time course of the decrease of total BHC and its isomers shows that total BHC residues in milk should decrease to less than 0.001 ppm.

73-2624. El-Dib, M. A.; Abdel-Warith, A. M.; Ismail, M. M. (Water Pollut. Contr. Nat. Res. Cent., Dokki, Cairo, Egypt). **Adsorption of Sevin and Baygon on powdered activated carbon.** *Z. Wasser Abwasser Forsch. 6(2): 63-68; 1973.* (22 references)

Adsorption of Sevin (carbaryl) and Baygon (propoxur) on powdered activated carbon followed the classical Langmuir and Freundlich isotherms. Equilibrium was reached with both compounds in 30 min, and the powdered carbon had a greater adsorption capacity for Sevin than for Baygon. The monolayer capacity of activated carbon amounted to 923 μmol/g for Sevin and 500 μmol/g for Baygon. Split-feed treatment reduced the amount of carbon needed to achieve the same results. With Sevin, a solution of 5 mg/l. in tap water could be reduced to 0.1 mg/l. by using a total of 58.8 mg/l. of carbon in two stages; 93 mg/l. was required for a single batch treatment. Approximately one and one-half times as much carbon was required to make the same reduction when pH was raised from 5 to 8. A similar effect was observed with Baygon, indicating that treatment with activated carbon should precede alkaline treatments. The process of coagulation was not satisfactory for the removal of carbamates.

See also 73-2544 73-2563 73-2634 73-2637 73-2648 73-2662 73-2707 73-2714 73-2730 73-2747 73-2751 73-2755 73-2756 73-2763 73-2764

73-2625. Kling, E. (Forstberatungsstelle, Limburgerhof, Germany). **Herbizid-Ausbringungstechnik, umweltschonende Verfahren. [Herbicide application techniques, methods of protecting the environment.]** *Allg. Forstz. 28(20): 480-481; 1973.* (6 references) (German)

Equipment and techniques for environmentally safe and acceptable applications of herbicides in farmlands and forests are described. Protection of the worker during herbicide application; selective application of herbicides for the protection of wildlife, edible berries, and other food sources; and minimization of entrainment of herbicide spray are basic factors to be considered in herbicide application. Entrainment and evaporation can be minimized by slowly moving the spray nozzle and by adjusting spray equipment for relatively large droplet size.

73-2626. Aaronson, R. M.; Spiro, H. M. (Dept. Intern. Med., Yale Univ. School Med., New Haven, CT). **Mercury and the gut.** *Amer. J. Dig. Dis. 18(7): 583-594; 1973.* (99 references)

Mercury contamination of the environment has resulted from the use of organic mercury seed dressings and slimicides as well as from industrial pollution. Methylmercury, one of the most lethal and stable forms, is present in some pesticides and can be made from phenylmercury by various organisms. While phenylmercury and other aryl compounds produce gastrointestinal symptoms, alkyl mercury produces, in addition to some gastrointestinal symptomatology, gross neurologic impairment. Available data suggest that methylmercury in food is almost completely absorbed in man and rat and unlike phenylmercury, it has been found in tissues of the central nervous system. Approximately 50% is excreted in the organic form in the feces. Research on the organic mercury compounds has centered on the neurologic disorders, but future investigation may implicate them in the pathophysiology of inflammatory bowel disease.

73-2627. Bidstrup, P. L. (Sloane Terrace, London SW1X9DG, England). **Clinical symptoms of mercury poisoning in man.** *Biochem. J. 130(2): 59P-61P; 1972.* (19 references)

Phenyl mercury compounds and short-chain alkyl mercury compounds, both used extensively to control fungus in the past, produce entirely different clinical symptoms. The former may irritate the skin, but systemic effects are few, and distribution in tissue is similar to that of inorganic mercury. Ethyl and methyl mercury are exceedingly toxic to the nervous system, causing severe generalized ataxia, dysarthria, and concentric constriction of the visual fields. Fatigue, impairment of memory, inability to concentrate, and numbness and tingling of the lips and fingers with slight tremor characterize mild poisoning. The alkyl mercury compounds accumulate in all tissue, particularly the brain, and are eliminated more slowly than inorganic or phenyl mercury compounds.

73-2628. Hazeltine, W. E. (Oroville, CA 95965). **DDT disagreement.** *BioScience 23(7): 400; 1973.*

A Letter-to-the-Editor indicates that C. F. Wurster has, in subsequent studies, found reported effects of DDT to be in question, but no effort has been made to refute earlier claims. In 1971, he found that 24 pairs of Bermuda petrels produced 12 young, an increase which appears to negate his predicted species decline. Growth of *Skeletonema costatum*, an original species in his photosynthesis studies, was enhanced in the presence of DDT in later studies. It is concluded that these findings ought to be publicized to correct information available on DDT.

73-2629. Karplus, M. (Greenberg Inst. Forensic Med., Hebrew Univ. Hadassah Med. Sch., Jerusalem, Israel). **[Endrin poisoning in children.]** *Harefuah 81(3): 113-116; 1971.* (9 references) (Hebrew)

Thirteen cases of endrin poisoning in children, seen in 1968 and 1969, are reported. Six of the cases were fatal. The children were between 2 months and 16 years of age, and the source of the endrin was not discovered in seven cases. In the remaining cases, endrin was ingested orally, either in solution or in the form of endrin-soaked grain. Characteristic symptoms were weakness, vertigo, blurred vision, headache, colicky abdominal pain, nausea, vomiting, convulsions, and coma, consistent with the powerful CNS irritating properties of endrin. Autopsies, performed in four cases, primarily revealed congestion of the brain and meninges with edema of the white matter, congestion and edema of the lungs with pleural hemorrhages, and congestion of the liver. (From author abstract)

73-2630. Freud, M.; Leffkowitz, M.; Elian, M. (Dept. of Internal Med., Carmel Hospital, Haifa, Israel). **[Clinical manifestations of thallium poisoning.]** *Harefuah 81(3): 140-141; 1971.* (7 references) (Hebrew)

A family of ten persons was hospitalized with thallium poisoning after drinking contaminated wine. Thallium was found in the urine and feces during analysis: the greater the amount of thallium present, the worse the condition of the patient. The most severe symptoms in one member of the family inlcuded weakness, confusion, vomiting, diarrhea, pains all over the body (especially in the arms), ataxia, disturbances of the nervous system, changes in the blood count, patches resembling ringworm on the scalp, high fever, tachycardia, abnormal ECG, general paralysis, and finally death. Two other members of the family manifested severe symptoms but did not die; five had mild symptoms; two did not have any symptoms at all, and thallium was not present in their urine. Treatment

included elimination of thallium by gastric lavage and use of activated charcoal; forced diuresis by intake of large amounts of fluid and use of potassium chloride; oral administration of diphenylthiocarbazone; symptomatic treatment. As a result of this case it was suggested that the use of thallium be restricted.

73-2631. Heyman, Y.; Assif, E. (Hadassah Hosp., Pediatric Clin., Tel Aviv, Israel). **[Arsenic poisoning.]** *Harefuah 82(3): 130-131; 1972.* (3 references) (Hebrew)

Because of the high level of environmental contamination today, the possibility of poisoning by environmental pollutants should be considered in all pathological occurrences of unknown origin. A five-year-old girl was hospitalized with high fever, jaundice, pruritus, aching joints, and liver swelling. Blood findings were abnormal: anemia, elevated leukocyte count, increased erythrocyte sedimentation rate, and high albumin levels were noted. These were initially assumed to result from an allergic reaction due to recent exposure to a mosquito spray. Antihistaminics and analgesics were prescribed. As the patient's condition deteriorated, steroids, antibiotics, and tranquilizers were added to the drug treatment, but no improvement occurred. Continued symptomatic treatment was followed by gradual improvement, except for the liver swelling, within four weeks. At two and one-half months after admission, exfoliative hyperkeratosis, with peeling of yellow scales from the skin, was observed. Since this indicated the possibility of arsenic poisoning, skin and hair samples were analyzed. Arsenic was found in these samples, as well as in the mosquito spray.

73-2632. Ramu, A.; Slonim, A. E.; London, M.; Eyal, F. (Dept. Pharmacol., Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). **Hyperglycemia in acute malathion poisoning.** *Isr. J. Med. Sci. 9(5): 631-634; 1973.* (21 references)

Of nine children exposed to malathion, four who were severely poisoned had hyperglycemia and glycosuria. These and other symptoms of organophosphate poisoning regressed rapidly with atropine and pralidoxime treatment. A case report of one of the children, exposed to the pesticide when her hair was washed with a solution containing 50% malathion in xylene to eliminate lice, illustrates the clinical picture. The child was admitted in a deep coma and was treated first to obtain a clear airway. Blood contained 3+ glucose and no acetone, and the insulin level was elevated, indicating that hyperglycemia was not a result of release of catecholamines. A total of 4.5 mg of atropine and 0.75 mg pralidoxime were administered over a 5-hr period and atropinization was maintained over the next 48 hr along with enough pralidoxime to treat recurrences of fasciculations. Within several months the patient recovered completely.

73-2633. Richardson, E. M.; Batteese, Jr., R. I. (Maine Pestic. Progr., Pub. Health Lab., Dept. of Health and Welfare, ME). **An incident of Zectran poisoning.** *J. Maine Med. Ass. 64(7): 158-159; 1973.* (3 references)

A co-pilot applying Zectran (mexacarbate) for spruce budworm control was exposed to the insecticide when a pinhole leak occurred in a high pressure pump line located ~12 feet behind his seat. He exhibited classical symptoms of carbamate poisoning and was taken to the hospital unable to stand and with hands and arms paralyzed. Atropine therapy was administered immediately, and the symptoms subsided quickly. ChE, severely depressed 10 min. after atropine therapy, returned to normal in three days, and the co-pilot did not experience any further difficulty during the remaining spray project. Proper treatment was initiated early in this case because the hospital staff were familiar with symptoms of pesticide poisonings, and were informed of the possible exposure to Zectran.

73-2634. Kazusa, W.; Kimoto, K.; Ikeda, N. (Nara Prefect. Inst. for Pub. Health, Nara, Japan). **[Accidental pollution by pesticides in a case of fire.]** *Nara-Ken Eisei Kenkyu Nenpo (Annu. Rep. Nara Prefect. Inst. Pub. Health) 6: 125-135; 1973.* (Japanese)

When many dead and floating fish were found in the Asuka River, the water was examined. A fire 10 hr earlier in a warehouse where 12 specified agricultural pesticides were stored had possibly caused an influx of drainage. Water taken from the river at 5 points, a tap water withdrawal point downstream, and some well-water near the warehouse were sampled every day for nine days after the fire. Samples were tested for pH, ammonia nitrogen, permanganate consumption, Cl^-, F^-, Hg^{++}, Zn^{++}, organophosphorus, PCP, sulfur, endrin, parathion, EPN, and BHC. The detection of small amounts of phenols, F^-, and organophosphorus, and of relatively large amounts of ammonia nitrogen suggested pesticide contamination. It was not possible to determine the time course of the pollution because of the time lag of more than 10 hr between the fire and the sampling, the influx of water from another river, and flooding of the Asuka River from typhoon No. 23.

73-2635. Moriyama, I.; Ide, H.; Ichikawa, H.; Hikosaka, R. (Saku General Hospital, Nagano Prefect., Japan). **[A death by acute pulmonary fibrosis after swallowing Gramoxone by mistake.]** *Nippon Kyobu-Shikkan Gakkai Zasshi (Jap. J. Thorac. Dis.) 11(5): 316; 1973.* (Japanese)

A farmer's wife, aged 68, swallowed by mistake about five ml of 24% liquid formulation of Gramoxone (paraquat dichloride), and was hospitalized five days after ingestion. Funicular and reticular shadows were recognized by roentgenography in both lower lungs at the time of hospitalization. From the second day in hospital she began to develop a dry cough and gradually

increasing dyspnea. Roentgenograms on the seventh hospital day showed increased funicular shadows covering all of both lungs. Steroids did not improve respiration. The patient died suddenly from cardiac arrest three weeks after hospitalization. Diffuse fibrosis of both lungs was found during autopsy. After induced vomiting and repeated gastric lavage, administration of a slurry of 300 g of bentonite in one liter of water by stomach tube is recommended for treatment. According to animal experiments, paraquat dichloride in the stomach is completely inactivated by bentonite. When applying Gramoxone in fields, large particles and an ordinary dust-proof formulation should be used to prevent fine droplets from entering alveoli.

73-2636. Gibson, M.; Watson, A. (c/o D. P. Sachs, Dept. of Genetics, Stanford Univ. Sch. Med., Stanford, CA 94305). **Pesticide exposure and protection of California farm workers.** *SWOPSI, Stanford, 1971, 26p.* (52 references)

The first part of this report presents a thorough discussion of chlorinated hydrocarbons, organophosphates, and carbamates in light of their chemical natures and their varying mechanisms of biological action. A review of existing legislation on use of pesticides at the federal, state, and local levels revealed that pesticide workers are poorly compensated for injury, due mainly to loopholes and language barriers between Workmen's Compensation Plans and the workers. There appeared to be an unaccountably high incidence of illness due to pesticide exposure among farm workers, due mostly to the background of the workers: lack of education, poverty, inadequate sanitation, isolation, and frequent moving. Some workers have removed protective clothing on hot days, oblivious to the danger of doing so. Exposure is usually incurred by applicators mixing and applying pesticides, by workers cleaning or flagging crop dusting planes, or by farm laborers sent prematurely to work in fields where pesticides were applied. In every situation dermal exposure was greater than respiratory exposure. Inadequate knowledge on the part of the medical profession concerning recognition and treatment of pesticide poisoning is highlighted. Several recommendations for lessening the danger of pesticide poisoning are offered.

73-2637. Gillett, J. W.; Harr, J. R.; Lindstrom, F. T.; Mount, D. A.; St. Clair, A. D.; Weber, L. J. (Oregon State Univ., Corvallis, OR 97331). **Evaluation of human health hazards on use of dichlorvos (DDVP), especially in resin strips.** *Residue Rev. 44: 115-159; 1972.* (117 references)

Experiments to date and a critical review of available literature and information on DDVP (dichlorvos) resin strips do not reveal any substantial hazardous effect on humans. Description of chronic inhalation exposure to DDVP from use of the strips is complicated by a deficiency of data adequately assessing the effects of environmental variables (especially temperature) on air concentrations. Mathematical modeling of ambient DDVP concentrations in air suggests that concentrations are reduced by lowering temperature or by increasing humidity or ventilation. Although the fate of material leaving the strip is not fully accounted for, intact DDVP is degraded rapidly in the body by several tissues irrespective of the route of exposure. Decreased cholinesterase activity, the best available method for preclinical assessment of organophosphate poisoning, is significant only if exposure to DDVP is continuous, ventilation is poor, and air concentrations are higher than 0.15 to 0.25 mg/m^3. Other than potential cholinesterase inhibition, DDVP exposure from resin strips did not create a significant health hazard. Developmental effects–mutagenicity, teratogenicity, and carcinogenicity–do not occur at sublethal dosages. Quantitative evaluation of subjective effects (headache, nausea) is not available. Dermal hypersensitivity is infrequent. (Author abstract by permission, abridged)

73-2638. Gillett, J. W.; Harr, J. R.; St. Clair, A. D.; Weber, L. J. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Comment on the distinction between hazard and safety in evaluation of human health hazards on use of dichlorvos, especially in resin strips.** *Residue Rev. 44: 161-184; 1972.* (13 references)

Although technical questions remain unanswered in the areas of chemical and biological accountability, unusual susceptibility, and psychological effects, no substantial hazard for use of dichlorvos resin strips has been evidenced. Because of the unknowns in all safety evaluations, wisdom and experience have indicated the need for a margin of safety between the exposure attendant to recommended usage and the exposure showing the least detectable effect. For the dichlorvos resin strips this margin is only a factor of two-to-four, instead of the customary ten-to-100. Further, the authors accept the tenet that exposure to a toxic chemical agent in the absence of demonstrable need and benefit is unwise, as might be the situation where such strips are used in the absence of susceptible insect species. (Author abstract by permission, abridged. Comments by the manufacturer of dichlorvos resin strips and the authors' replies to these comments follow the main article.)

73-2639. Miyawaki, K.; Wakiya, T. (Misho Health Cent., Ehime Prefect., Japan). **[On the results of investigation on injuries due to pesticide in Waguchi, Misho Town.]** *Shikoku Koshu Eiseigaku Zasshi (J. Shikoku Pub. Health Soc.) 18: 21-22; 1973.* (Japanese)

Pesticide application and injuries due to application for 1971 and 1972 were examined. Attention was given to application and storage of pesticides, garments worn during application, treatment of emptied con-

tainers, health of people living in districts where pesticides were applied, ocular examinations on school children, and investigations on pesticide residues. In 1971, 57 men and 28 women used pesticides; in 1972, 58 and 28. In 1971 and 1972, 6.5 and 29.5% of the users respectively wore dust-proof masks, 86.9 and 43.2% used a gauze mask or towel for masking, 6.6 and 27.2% went without masks, 6.5 and 3.5% wore waterproof coats, 86.9 and 95.2% wore long-sleeved shirts, 0 and 1.3% short-sleeved shirts, 2.2 and 33.6% rubber gloves, 36.9 and 2.6% cotton gloves, and 60.9 and 63.8% no gloves. Of 57 and 58 people examined in 1971 and 1972 respectively, 22.8 and 13.8% had health problems. Of the 118 school children examined in three districts where pesticides were used in 1971 and 1972, 51 and 37 respectively had normal visual acuity, 67 and 15 had acuity less than 1.0, 10 and 22 had less than 1.0 even after correction, 5 and 14 had abnormal visual fields, and 10 and 0 had abnormal fundus findings. According to these results the farmers' knowledge and health consciousness have increased.

73-2640. Dikova, R.; Krustev, L. (Bulgarian Acad. Sci., Inst. of Nutr. Sofia, Bulgaria.) **Vliyaniye na khlororganichnite pestitsidi vurkhu sustoyaniyeto na cherniya drob. [Effect of organochlorine pesticides on the liver.]** *Suvrem. Med. 23(9): 35-38; 1972.* (Bulgarian)

It has been suggested that the increased incidence of hepatitis in humans at present is due to excessive agricultural application of organochlorine insecticides such as DDT, lindane, aldrin, dieldrin, chlordane, and BHC. All of these pesticides are poorly soluble in water and readily soluble in organic solvents, have high affinity for lipids, and may damage the nervous system and parenchymal organs. Hepatic manifestations of chronic organochlorine poisoning include severe cytoplasmic lesions of the hypertrophic type, peripheral migration of kinoplasm, moderate granulation, and presence of zones of focal cell degeneration. The absence of marked clinical abnormalities does not prove absence of liver damage. Pathological cellular changes in the early stages of pesticide poisoning are the only indications of harmful effects on the liver.

73-2641. Aronson, A. L. (Dept. Physiol. Biochem. Pharmacol., New York State Vet. Coll., Ithaca, NY). **Chemical poisoning in small animal practice.** *Vet. Clin. N. Amer. 2(2): 379-395; 1972.* (35 references)

General procedures for treating a case of poisoning in small animals include prevention of further absorption of the poison, aiding the removal of absorbed poison, and combating the effects of the poison. Specific types of treatment are required for poisoning by various pesticides. Thallium poisoning can probably be treated most effectively with Prussian Blue which binds thallium and is eliminated in the feces. Atropine sulfate is the preferred pharmacologic antidote for organophosphate intoxication, and the prompt administration of oximes which reactivate ChE is also recommended. Transfusion of whole blood is the most effective treatment for warfarin poisoning, and the administration of vitamin K_1 can aid in the production of prothrombin and other clotting factors.

73-2642. WHO Expert Committee on Insecticides (Geneva, Switzerland). **Safe use of pesticides.** *WHO Tech. Rep. Series 513: 1-54; 1973.*

The hazards of pesticides, especially DDT and dichlorvos, to public health are considered in relation to tumorigenicity in mice, storage and excretion of pesticide residues, levels present in the human population, and morbidity studies. Programs are presented for the evaluation and testing of new insecticides specifically designed for indoor application, for use as larvicides, and for use in human louse control. The use of dichlorvos in aircraft disinsection, as well as alternative methods of insect control are discussed. Safety considerations are suggested for chemical insecticides, molluscicides, rodenticides, and for various means of vector control in which ultra-low-volume applications of insecticides, either from aircraft or from ground equipment, will be important. Hazards inherent to the general public and the operators in this type of application are considered. Toxicological observations from field trials conducted since 1966 are presented for 11 new insecticides designed for indoor use. Two of these, propoxur and fenitrothion, are suggested as possible DDT substitutes. Recommendations of substitutes for currently unacceptable, hazardous rodenticides are given. Recent developments in the diagnosis and treatment of pesticide poisoning are reviewed.

73-2643. Henny, C. J. (U.S. Dept. Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Migratory Bird Populations Station, Laurel, MD 20810). **An analysis of the population dynamics of selected avian species. With special reference to changes during the modern pesticide era.** *Wildlife Research Report No. 1, GPO, Washington, 1972, 99 p.* (169 references)

A study of population dynamics showed that postfledging mortality rates did not increase in any of the species investigated, suggesting the accelerated declines in these species as a result of lower reproductive success. With species which feed primarily on mammals, no change in recruitment rates was apparent. In those species feeding mostly on fish, reptiles, amphibians, or birds, a lowered reproductive success was evident. This was often accompanied by a decrease in the thickness of the egg shell. Egg shell thinning has been produced experimentally in laboratories where sparrow hawks and mallard ducks were fed a diet of DDT derived compounds and dieldrin. Many of the species which have declined in population are those whose food contained chlorinated hydrocarbon pesticides concentrated through a series of transfers along food chains.

73-2644. Schumacher, K. (Militaermedizinische Sektion, Ernst-Moritz-Arndt-Univ., Greifswald, DDR). **Die Wirkung chemischer Kampfstoffe–Symptomatik und Therapie. [Effect of poisons used in chemical warfare–symptomatology and therapeutics.]** *Z. Aerztl. Fortbild. 64(3): 97-106; 1970.* (21 references) (German)

Symptomatological and therapeutical problems of poisons used in chemical warfare are reviewed. The chemicals discussed include pesticides, which may be used as "sabotage poisons" in guerrilla warfare. Organophosphorus poisons produce muscarinic and nicotinic effects with such symptoms as painful miosis, hyperemia and hypersecretion of the mucosa, epigastric pain, bradycardia, clonic-tonic spasms, paresis, and respiratory center depression. When contact with the skin occurs up to 90% of the poison penetrates into the skin in 10 min. The skin should be cleansed with sodium *p*-cresolate, sodium bicarbonate, or ammonia. Administration of activated carbon and magnesium sulfate, gastric lavage, or mechanically induced emesis are necessary in case of oral uptake. Slow i.v. or i.m. administration of 2-3 mg of atropine, possibly within the first 10 min after poisoning, and usually continued for at least 24 hrs, and then 250 mg of obidoxime or 500 mg of pralidoxime represents the most efficient antidote therapy. Up to 100 mg of atropine may be necessary within the first 24 hrs. Other pesticides which may be used as sabotage poisons include arsenic, mercury, and thallium compounds.

73-2645. Kluge, W.; Olbrich, H. (Chirurg. Abt., Kreiskrankenhaus Bautzen, Germany). **Vergiftung mit DDT und Lindan. [Poisoning by a DDT-lindane combination.]** *Z. Aertzl. Fortbild. 66(19): 980-982; 1972.* (30 references) (German)

A two-year-old boy was admitted to the emergency ward within half an hour after drinking a large quantity of insecticide solution, which was first assumed to contain an organophosphate. Prior to admission, symptoms were vomiting, stumbling, loss of consciousness, and limb spasms. Supportive therapy was initiated in the intensive-care unit. After it was discovered that the poison ingested contained DDT and lindane, hexobarbital was administered to control convulsions. Positive-pressure respiration and administration of diuretics, liver stimulants, steroids, and antibiotics were continued until symptoms stabilized. Convulsions ceased after 48 hours of continuous administration of nitrous oxide-oxygen, but an air-oxygen mixture was given until consciousness was restored on the third day of treatment. The child was transferred to the pediatric ward practically symptom-free on the sixth day. Blood and CSF findings at this time were in the normal range. The EEG showed areas of subcortical disturbance, which failed to appear on a check-up EEG recorded three months later. The child's recovery from severe symptoms after ingestion of ca. 250 g of DDT + lindane was attributed to rapid initiation of vigorous treatment. Eleven pesticide poisonings accounted for 4% of the poisoning cases seen at the Bonn University Pediatric Clinic in 1968.

See also **73-2571** **73-2573** **73-2575** **73-2580** **73-2704**

73-2646. Perez Castrillo, R.; Guzman, C. (Exp. Med. Inst., Venezuelan Cent. Univ., Caracas, Venezuela). **Chlorofenotane's action (p,p'-DDT) on the thyroid gland of the rat.** *Acta Endocrinol. Panamer. 3(2): 203-214; 1972.* (13 references)

A dose- and time-dependent increase in thyroid weight and a stimulation of iodine uptake were observed in rats treated with DDT. Thyroid weight significantly increased after administration of 105 mg/kg for 20 days, 90 and 105 mg/kg for 30 days, and 60, 90, and 105 mg/kg for 40 days. Although gland weight gain leveled off at 40 days, iodine uptake in treated animals continued to rise. Small decreases in hematocrit values, moderate hepatomegaly, and weight loss resulted from the doses administered, but the general condition of the animals was good throughout the experiment. A higher oxygen consumption and an accelerated rate of discharge of radioactive iodine from the thyroid were found in treated animals. The effects of DDT resemble thyroid hyperfunction, which could be confirmed in another animal by determining thyroid hormone in the blood.

73-2647. Shida, T.; Homma, Y.; Misato, T. (Cent. Res. Labs., Ajinomoto Co., Inc., Kawasaki, Japan). **Control of plant disease by amino acid derivatives. II. Bacterial degradation of *N*-lauroyl-L-valine.** *Agr. Biol. Chem. 37(5): 1027-1033; 1973.* (3 references)

Studies were conducted on the degradation of *N*-lauroyl-L-valine by type cultured bacteria. Many strains could utilize sodium *N*-lauroyl-L-valinate as carbon and nitrogen sources for their growth. Metabolism of *N*-lauroyl-L-valine was investigated in detail using *Ps. aeruginosa* AJ2116. Lauric acid was identified by gas chromatography suggesting cleavage of *N*-acyl linkage in *N*-lauroyl-L-valine. Lauric acid might be metabolized to capric acid (C_{10}) and caprylic acid (C_8) because the accumulated substances gave nearly identical peaks with those of authentic fatty acids on gas chromatograms. The experiment using *N*-lauroyl-L-valine (^{14}C) indicated that $^{14}CO_2$ was produced as a final product. Valine was not detected because it might be metabolized very rapidly immediately after its release. It was supposed that the enzymes or enzyme systems degrading *N*-lauroyl-L-valine might be constitutive from the experiment using two kinds of cells grown in the medium containing *N*-lauroyl-L-valine or nutrient broth. (Author abstract by permission)

73-2648. Ishizuka, K.; Takase, I.; Tan, K. E.; Mitsui, S. (Inst. Phys. Chem. Res., Wako-shi, Saitama, Japan). **Absorption and translocation of *O*-ethyl *S,S*-diphenyl phosphorodithiolate (Hinosan) in rice plants.** *Agr. Biol. Chem. 37(6): 1307-1316; 1973.* (8 references)

The fate of Hinosan in and on rice plants was investigated using gas-liquid chromatographic, radioautographic, and scintillation counting techniques. Hinosan, applied to a glass plate at 5 $\mu g/cm^2$, was remarkably resistant to dissipation. Almost 50% of the applied Hinosan remained after 10 days under UV irradiation, and over 90% after 10 days in the dark. Less than 10% of the Kitazin applied remained after one day under UV or five days in the dark, whereas about 20% of the parathion remained after ten days under either circumstance. When Hinosan dissipation from the surface of rice leaves was investigated, several hydrolysis products of Hinosan were detected in the aqueous extract, but they accounted for only a small fraction of the Hinosan applied. The amount translocated from leaves to roots was also low, indicating that the majority of the Hinosan was dissipated by volatilization and decomposition. Accumulation of Hinosan from treated roots or leaves in the rice grains was negligible, in all cases remaining below the detection limit of 0.01 ppm.

73-2649. Ueyama, I.; Uesugi, Y.; Tomizawa, C.; Murai, T. (Pestic. Inst., Nihon Tokushu Noyaku Seizo Co. Ltd., Hino, Tokyo, Japan). **Metabolic fate of *O*-ethyl *S,S*-diphenyl phosphorodithiolate (Hinosan) in rice plant.** *Agr. Biol. Chem. 37(7): 1543-1551; 1973.* (6 references)

Metabolism and residual fate of Hinosan applied on rice plant was examined by using ^{35}S-labeled or ^{32}P-labeled compound. Ion exchange chromatography, thin-layer chromatography and gas-liquid chromatography with flame thermionic detector or flame photometric detector were applied for identification of water soluble and toluene soluble metabolites of Hinosan. Degradation of Hinosan at the initial stage of metabolism was mainly the cleavage of P-S linkage, and a large portion of phenyl dihydrogen phosphorothiolate and a minor portion of *O*-ethyl *S*-phenyl hydrogen phosphorothiolate were found as water soluble metabolites. Phenylthio radical released on the production of the above mentioned metabolites was recovered as diphenyl disulfide, which was finally converted to sulfuric acid through benzenesulfonic acid. Triphenyl phosphorotrithiolate and *O,O*-diethyl *S*-phenyl phosphorothiolate were produced by transesterification between molecules of Hinosan at the initial stage of metabolism. Examination of metabolites in rice grains showed that sulfur and phosphorus atoms in Hinosan were incorporated into neutral or cationic substances probably after several steps of chemical transformation. (Author abstract by permission)

73-2650. Yamamoto, H.; Tomizawa, C.; Uesugi, Y.; Murai, T. (Biol. Inst., Kumiai Chem. Industry Co. Ltd., Kikugawa, Shizuoka, Japan). **Absorption, translocation and metabolism of *O,O*-diisopropyl *S*-benzyl phosphorothiolate (Kitazin P) in rice plant.** *Agr. Biol. Chem. 37(7): 1553-1561; 1973.* (11 references)

Behavior and metabolism of Kitazin P in rice plant were examined using ^{32}P, ^{35}S-double labeled compound. Uptake of Kitazin P by the plant was dif-

ferent with the growth stages of the plant, and the rate of uptake was rapid in early growth stage. Kitazin P penetrated into plant tissues was gradually hydrolyzed to produce *O,O*-diisopropyl hydrogen phosphorothioate which was converted to diisopropyl hydrogen phosphate, isopropyl dihydrogen phosphate and phosphoric acid. As toluene soluble metabolites, eight spots were detected by thin-layer chromatography, but their percentages in toluene soluble fraction were extremely low as compared with that of Kitazin P. Only two metabolites, dibenzyl disulfide and *O,O*-diisopropyl *O*-benzyl phosphorothionate were identified by gas-liquid chromatography with a flame thermionic detector or a flame photometric detector. Diisopropyl hydrogen phosphorothioate were detected as a persistent metabolite even in rice grains. (Author abstract by permission)

73-2651. Takase, I.; Tan, K. E.; Ishizuka, K.* (Inst. Phys. Chem. Res., Wako-shi, Saitama, Japan) **Metabolic transformation and accumulation of *O*-ethyl *S,S*-diphenyl phosphorodithiolate (Hinosan) in rice plants.** *Agr. Biol. Chem. 37(7): 1563-1571; 1973.* (4 references)

^{32}P-labeled organophosphorus fungicide Hinosan was sprayed on rice plants at various growth stages, and metabolic fate of the pesticide in the rice plants was studied. Identification of Hinosan and its metabolites in the *n*-hexane and water extracts was conducted by TLC and GLC (FPD). The rate of hydrolysis of Hinosan in rice plants seemed to be slower than that of other organophosphorus pesticides. Hexane-soluble components, which were detected throughout the experimental period, consisted mainly of Hinosan. Among the water-soluble metabolites identified were *O*-ethyl *S*-phenyl phosphorothioic acid and *S,S*-diphenyl phosphorodithioic acid, which were detected one to four days after the application, and ethyl phosphate and phosphoric acid which increased with the lapse of time. Upon examination of the radioactivity of Hinosan and its metabolites in rice grains, a certain level was detected in husk, but very little in hulled rice and polished rice. (Author abstract by permission)

73-2652. Khan, M. A. Q.; Kamal, A. (Univ. Illinois, Chicago Circle, IL). **In vivo and in vitro epoxidation of aldrin by food chain organisms.** *Amer. Zool. 12(4): 686; 1972.*

Microcrustaceans, insects, and molluscs absorb aldrin from aqueous suspensions and oxidize it to dieldrin at varying rates. In vitro epoxidation of aldrin occurs in microsomes from gut, liver, kidney, and nerve tissue in crayfish, snails, and clams. The system is active over a very narrow pH range in tissues other than clam liver and crayfish green gland. Buffer molarity and temperature also markedly affect activity.

73-2653. Lazarov, V. P. (Inst. Superieur Med. Vet., Chaire Physiol. Pathol., Sofia 13, Bulgaria). **Etude de l'action pathophysiologique du Neguvon dans l'organisme des volailles. Communication 1. L'influence du Neguvon sur certains indices cliniques et hematologiques dans l'organisme des volailles. [Study of the pathophysiologic effects of Neguvon in poultry. Part 1. The influence of Neguvon on certain clinical and hematological indices in poultry.]** *Ann. Med. Vet. 117(3): 183-192; 1973.* (21 references) (French)

Clinical symptoms of poisoning, including increased salivation, a bluish tint to the extremities, and intensified respiration, appeared in chickens 30 to 60 min after oral administration of Neguvon (trichlorfon) in water at a dose of 65 mg/kg. No deaths occurred and symptoms disappeared within 10 to 12 hours. A dose of 130 mg/kg was lethal to some of the birds; lung, liver, and intestines of dead birds were affected. A slowing of the erythrocyte sedimentation rate and an insignificant increase in hemoglobin were observed, but these were attributed to a reduction in blood volume following excessive secretion. An 87.5% decrease in plasma ChE activity was noted one hour after administration, and the enzyme had not recovered in 72 hours. A similar decrease in plasma ChE activity was observed when trichlorfon was administered orally in physiological solution. Such administration resulted in almost no symptoms, suggesting that the toxic action of the pesticide is not solely based on anti-ChE activity.

73-2654. David, D. (Lab. Biol. Anim., Univ. Clermont, B. P. 45, 63170 Aubiere, France). **Action toxique du DDT sur le foie d'embryons de Poulet et de caille. Etude ultrastructurelle. [Toxic action of DDT on the chick and quail embryonic liver. Ultrastructural study.]** *Arch. Anat. Microsc. Morphol. Exp. 62(1): 1-13; 1973.* (34 references) (French)

Pre-incubation treatment of chick and quail eggs by 30-second immersion in aqueous solutions of DDT resulted in ultrastructural changes in hepatic cells after 18 and 14 days, respectively. Electron microscopy revealed nuclear edema and lipid deposits in the nucleoplasm and alterations in the nucleolar structure which suggested a slowing-down of the RNA synthesis and some nuclear degeneration. In the cytoplasm mitochondria were swollen, deficient in cristae, and malformed. Endoplasmic reticulum was dilated; ribosomic covering of the ergastoplasmic cisternae reduced; Golgi apparatus vacuolar; glycogen contents reduced; and the lipid and lysosomal inclusions increased. The nature of the lesions observed is compatible with the theory that DDT reduces mitochondrial respiratory and phosphorylating enzyme activity and increases that of hepatic microsomal enzymes. The hepatic cell reacts as an injured cell, and the sequence of reactions may lead to total cytoplasmic and nuclear lysis of many hepatic cells.

73-2655. Klinger, W.; Gmyrek, D.; Gruebner, I. (Inst. Pharmakol. Toxikol., Friedrich-Schiller Univ., Jena,

DDR). **Untersuchung verschiedener Stoffe und Stoffklassen auf Induktoreigenschaften. III. Chlorierte Insektizide. [Examination of various materials and classes of materials for induction effects. III. Chlorinated insecticides.]** *Arch. Int. Pharmacodyn. Ther. 202(2): 270-280; 1973.* (51 references) (German)

The induction effects of the chlorinated insecticides DDT, DMDT (methoxychlor), α-BHC and γ-BHC (lindane), Alugan (bromocyclen), and chlordane have been investigated in 30-day-old rats after administering equitoxic doses, according to hexobarbital sleeping time, ascorbic acid excretion in urine, and aminopyrine-*N*-demethylation by 9000 *g* × 20 min liver supernatant. Lindane, chlordane and α-BHC are potent inducers similar to phenobarbital, while the others are less active. These six insecticides exert different induction effect patterns. Upon investigating the time course of hexobarbital sleeping time after a single administration, an initial inhibitory effect and after 6 hr an induction effect can be observed. Maximum hexobarbital sleeping times are reached after 24 hr; only for lindane is it determined already after 12 hr. For clinical trial in newborns lindane seems to be the most suitable. (Author abstract by permission, edited)

73-2656. Weetman, D. F.; Cain, K.; Sweetman, A. J. (Dept. Pharmacol., Sch. Pharm., Sunderland Polytechnic, Sunderland SR1 3SD, England). **The mechanism of the myocardial depression produced by congeners of the acaricide, fenazaflor.** *Arch. Int. Pharmacodyn. Ther. 203(2): 342-347; 1973.* (13 references)

A series of trifluoromethylbenzimidazoles, related to the acaricide fenazaflor, were found to depress contractility in isolated rat atria. The same compounds also uncoupled oxidative phosphorylation in rat heart micochondria, and there was a significant correlation ($r = +0.82$, $P < 0.05$) between these two actions. (Author abstract by permission)

73-2657. Briquet, M. (Lab. Enzymol., Univ. Louvain, Louvain, Belgium). **Le ziram, inhibiteur preferentiel de l'oxydation et de la permeation du succinate chez les mitochondries de levure. [Ziram, a preferential inhibitor of oxidation and permeation of succinate in yeast mitochondria.]** *Arch. Int. Physiol. Biochim. 81(2): 360-361; 1973.* (1 reference) (French)

At a concentration of 30μ*M*, ziram inhibited oxidation of succinate in intact mitochondria by 77%; this inhibition of oxidation could be reversed by addition of other substrates like ethanol, NADH or α-glycerophosphate. The activity of succinate-phenazine methosulfate oxidoreductase, either in submitochondrial particles or solubilized and partially purified, was inhibited from 30 to 50% by the same concentration of ziram. Permeation of succinate, measured, in the absence of respiration, by swelling of mitochondria in an isotonic solution of its ammonium salt, was markedly slowed by 30μ*M* ziram. With the exception of malate, the permeation of other substrates such as α-glycerophosphate, citrate, and α-ketoglutarate was not affected. The results suggest a close relation exists between catalytic function and the transport of the dicarboxylic anion at the enzyme level.

73-2658. Propping, P.; Buselmaier, W.; Roehrborn, G. (Inst. Anthropol. Humangenet. Univ. Heidelberg, Heidelberg, Germany). **Kritische Betrachtung ueber die intra-animale Kultur von Mikroorganismen, eine Methode zum Nachweis chemisch induzierter Mutationen. [Critical considerations on the host-mediated assay, a method for detection of chemically induced mutations.]** *Arzneim.-Forsch. 23(6): 746-749; 1973.* (16 references) (German)

The host-mediated assay, or "intra-animal culture of microorganisms" as it is called in German, is suitable for use as a routine test for chemically induced point mutations. Since the test microorganisms are cultured in the peritoneal cavities of animals treated with the test substances, they are exposed to the same metabolic products to which the mammalian organism is exposed. Results obtained by the host-mediated assay and an in vitro culture method are compared for 69 chemicals, including pesticides and pesticide degradation products. Ethylene dibromide and captan were mutagenic in the host-mediated assay using *Salmonella typhimurium* in a reverse mutation test, and captan gave positive results with *Serratia marcescens* a21 as well. MCPB gave questionable results in the former system. In vitro tests detected mutagenic activity for dichlorvos, ethylene dibromide, and captan. No evidence of mutagenicity was found using either assay for DDT, DDE, DDA, lindane, *p*-nitrophenol, 2,4,5-T, 2,4,5-TB, MCPA, PCP, or PCNB.

73-2659. Reiner, R.; Scherer, A. (Battelle-Institut e.V., Frankfurt am Main, Germany). **Wirkung von Mono- und Bisammoniumacetonoximsalzen auf Acetylcholinesterase und DFP. [Effects of mono- and bisammonium oxime salts on acetylcholinesterase and DFP.]** *Arzneim.-Forsch. 23(8): 1041-1044; 1973.* (12 references) (German)

The autoinhibition, reactivating potency against DFP-inhibited AChE, and the *P*-nucleophilicity of some bisammonium acetonoximes were examined in comparison to those of other known or potential ChE reactivators. Symmetrical and asymmetrical bisammonium acetoximes bridged by propylene, 2,3-dihydroxybutylene, and dimethylene ether groups were investigated. The nucleophilicity with respect to DFP was good for all compounds tested, and was comparable to that of the pyridinium oximes. The autoinhibition is low compared to that of the pyridinium oximes. A trend was noted for higher autoinhibition to occur in the case of the more hydrophobic isopropyldimethylammonium groups which undergo hydrogen bonding. None of the compounds tested was suitable for direct use as a cholinesterase reactivator at present, primarily because of their low acidity.

73-2660. Bustamante, E.; Pedersen, P. L. (Dept. Physiol. Chem., Johns Hopkins Univ. Sch. Med., Baltimore, MD 21205). **Tetradifon: an oligomycin-like inhibitor of energy-linked activities of rat liver mitochondria.** *Biochem. Biophys. Res. Commun. 51(2): 292-298; 1973.* (10 references)

Tetradifon (*p*-chlorophenyl-2,4-5-trichlorophenyl sulfone) at concentrations between 4.5 and 27.0 moles/mg mitochondrial protein provides half-maximal inhibition of the following energy-linked activities of rat liver mitochondria: ADP-stimulated respiration, DNP-stimulated ATPase activity, Mg^{++}-stimulated ATPase activity, and Pi-ATP exchange activity. Tetradifon has no effect on the activity of soluble ATPase purified from rat liver mitochondria. Respiration inhibited by tetradifon is restored upon addition of 2,4-dinitrophenol. It is concluded that tetradifon acts at or near the oligomycin sensitivity conferring complex located in the mitochondrial inner membrane. (Author abstract by permission)

73-2661. Satyanarayana, T.; Getzin, L. W. (Ames Res. Cent., Nat. Aero. Space Admin., Moffett Field, CA 94035). **Properties of a stable cell-free esterase from soil.** *Biochemistry 12(8): 1566-1572; 1973.* (22 references)

A stable, extracellular esterase, capable of degrading malathion, was isolated from Chehalis clay loam, purified 560-fold, and characterized. Optimum activity was obtained at pH 7.5 and the apparent *Km* for malathion was 6.06×10^{-5}. Unlike the animal enzymes which hydrolyze malathion, the preparation catalyzed the hydrolysis of aromatic, but not aliphatic, esters. Phosphonates (dichlorvos, crotoxyphos, mevinphos and *O*-zinophos, *O*-thionazin) and phenyl thiophosphates (parathion, V-C13 (dichlofenthion), EPN, and ronnel), as well as malaoxon, effectively inhibited the reaction but were not hydrolyzed by the esterase. All of the properties essential to stability in soil were exhibited by the enzyme, *i.e.* thermal stability, resistance to proteolytic attack, tolerance of pH extremes, apparent lack of requirement for cofactors, and tolerance to heavy metals and common enzyme inhibitors. The chemical composition and response of the enzyme to treatment with HCl or hyaluronidase suggested a carbohydrate-protein structure.

73-2662. Daniel, J. W. (I. C. I. Ltd., Ind. Hyg. Res. Lab., Alderley Park, Macclesfield, Cheshire SK10 4TJ, England). **The biotransformation of organomercury compounds.** *Biochem. J. 130(2): 64P-65P; 1972.* (13 references)

Although organomercurials are degraded to inorganic mercury in mammals, soil, and microorganisms, the mechanisms of transformation have not been entirely elucidated. Results of studies with the rat suggest that methoxyethylmercury is degraded nonenzymatically in the tissue of this animal to ethylene and Hg^{2+}. Sodium *o*-[(3-hydroxymercuri-2-methoxypropyl)carbomyl] phenoxyacetate (mersalyl), although acid-labile, was excreted largely unchanged by the rat. A cell-free extract of a mercury-resistant pseudomonad in the presence of NAD(P)H and thioglycolate converted phenylmercury, methylmercury, and ethylmercury into metallic mercury and benzene, methane, and ethane, respectively. The enzyme responsible, found in the soluble fraction and not dependent on NAD(P)H, converted *p*-chloromercuribenzoate and methoxyethylmercury, but not methylmercury or mersalyl, to Hg^{2+}. The reaction in both mammals and bacteria may be hydrolytic, and Hg^{2+} liberated in the microbiological system may be rapidly reduced to metallic mercury by an NAD(P)H-dependent enzyme. Phenylmercury in soil is probably degraded by microorganisms while the ethyl and methylmercury salts are primarily lost through volatilization.

73-2663. Franklin, C.; El-Tayeb, I. B. (Dept. Pharmacol., Chelsea Coll., London SW3 6LX, England). **Structure-activity relationships for the induction and inhibition of hepatic microsomal enzymes in the rat by organohalogen compounds.** *Biochem. J. 130(2); 90P-91P; 1972.* (1 reference)

About 50 halogen derivatives of ethane, benzene, biphenyl, and diphenylethane were administered to rats at 100 μmol/kg for seven days; their effects on hepatic drug metabolizing enzymes were investigated. Previous studies showed no correlation between toxicity of compounds related to DDT and their inductive effects, but present work may lead to a better understanding of the mechanism of microsomal enzyme induction. A comparison has been made of the results of these experiments with certain physicochemical properties of the compounds.

73-2664. Bergmann, F.; Govrin, H. (Dept. Pharmacol., Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). **Influence of pyridine-2-aldoxime-methochloride (PAM) on non-enzymic and enzymic ester hydrolysis.** *Biochimie 55(5): 515-520; 1973.* (18 references)

Pyridine-2-aldoxime (PAM) and its methochloride did not split acetylcholine, ethyl acetate or triethyl phosphate, but did react with *p*-nitrophenyl acetate and acetylthiocholine. From the analysis of the two products of hydrolysis it appeared that the alcohol component was liberated first with acetylation of the oximes, and deacetylation of the oximes also occurred. PAM inhibited the hydrolysis of ACh by *Torpedo marmorata* AChE, but appeared to accelerate the enzymic hydrolysis of acetylthiocholine. The facts that PAM reacted with "active" esters only and that PAM was inert towards trialkyl phosphates support the assumption that oxime reactivation of PO-inhibited ChE (a neutral phosphate) requires "active" participation of the esteratic site.

73-2665. Udagawa, T.; Saito, T.; Miyata, T. (Sch. of Appl. Entomol. and Nematol., Fac. Agr., Nagoya Univ., Nagoya, Japan). **[Metabolism of pyridafenthion, *O,O*-diethyl-*O*-(3-oxo-2-phenyl-2*H*-pyridazin-6-yl) phosphorothioate, in mouse and rat.]** *Bochu-Kagaku (Sci. Pest Contr.) 38(2): 75-81; 1973.* (6 references) (Japanese)

^{32}P- and 3,6-pyridazine-^{14}C-pyridafenthion, with specific radioactivity of 13.0 mCi/g and 1.116 mCi/g, were orally administered via stomach tube to ICR-JCL and DD mice (30-40 g) and Wistar rats (150-160 g) at doses of 20 mg/kg to mice and rats and 200 mg/kg to mice as solutions in propylene glycol. Excretion in the urine was determined at regular intervals and radioactivity of the feces and of various organs was determined 24 hr after treatment. In all cases more than 70% of the administered dose was excreted in the urine as decomposed products. When the animals were fed unlabeled pyridafenthion for three weeks at 100 ppm in the feed, the greater part of the administered insecticide was excreted in the urine as water soluble substances. The main metabolites identified were phenyl maleic hydrazide and desethyl-pyridafenthionoxon in rats and phenyl maleic hydrazide, its glucuronide, desethyl-pyridafenthion, and desethyl pyridafenthionoxon in mice respectively. From these findings the major breakdown of pyridafenthion in mice and rats occurred by the cleavage of *P-O*-heterocyclic ring bond. The ^{14}C-ring moiety and ^{32}P-*O,O*-diethyl phosphorothioic acid were also excreted rapidly.

73-2666. Davison, K. L. (U.S.D.A., Agr. Res. Serv., Metab. Radiation Res. Lab., State Univ. Station, Fargo, ND 58102). **Dieldrin-^{14}C balance in rats, sheep and chickens.** *Bull. Environ. Contam. Toxicol. 10(1): 16-24; 1973.* (6 references)

A study was conducted using rats, chickens, and sheep to determine the excretion pattern of carbon-14 during constant ingestion of ^{14}C-dieldrin. In rats, initial excretion was greater in males than in females but both sexes attained balance by six weeks regardless of the dose of dieldrin. In the 39-wk experiment female rats retained about 7% of the dose administered; males retained about 2%. Roosters attained a balance by 22 or 26 wk depending on the level of dieldrin in the diet and retained about 30% of the dose in the carcass at 37 wk. Hens attained a balance by 25 wk at either level and retained from 14 to 28% of the dose in the carcass. Egg laying was intermittent and tremors and seizures followed by death occurred in some chickens on the 2.0 μg/g diet. Data obtained from sheep were inconclusive.

73-2667. Poorman, A. E. (Biol. Dept., Kearney State College, Kearney, NB). **Effects of pesticides on *Euglena gracilis*. I. Growth studies.** *Bull. Environ. Contam. Toxicol. 10(1): 25-28; 1973.* (4 references)

Significant inhibition of growth of *Euglena gracilis* resulted from exposure to 2,4-D, 2,4,5-T, aldrin, DDT, malathion, parathion, and methoxychlor at 50 and 100 ppm for 24 hr. Growth was stimulated by these compounds at lower concentrations and at all concentrations when exposure was extended for seven days except in the case of 2,4-D and 2,4,5-T. A reversible alteration in cell morphology was noted with 2,4-D and 2,4,5-T. The insolubility of most of the pesticides examined greatly reduces the possibility that detrimental effects could be observed in nature.

73-2668. Meikle, R. W. (Ag-Org. Res. Lab., Dow Chem. U. S. A., 2800 Mitchell Drive, Walnut Creek, CA). **Metabolism of 4-dimethylamino-3,5-xylyl methylcarbamate (mexacarbate, active ingredient of Zectran insecticide): a unified picture.** *Bull. Environ. Contam. Toxicol. 10(1): 29-36; 1973.* (17 references)

A unified reaction scheme for the metabolism of mexacarbate has been constructed from the relatively small amount of information available concerning this process in several biological systems. Formation of water-soluble metabolites is similar in plants, animals, insects, and soil. These substances are transported in plants to regions of active secondary growth and are eventually transformed to lignin and other polymolecular ergastic substances of the cell wall and materials extraneous to the cell wall. Soil microorganisms, unlike plants and animals, do not conjugate the xylenol intermediates rapidly allowing *N*-demethylation and ring-opening reactions.

73-2669. Wassermann, M.; Wassermann, D.; Kedar, E.; Djavaherian, M.; Cucos, S.; Ventura, S. (Dept. Occup. Health, Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). **Effect of organochlorine compounds on serum proteins.** *Bull. Environ. Contam. Toxicol. 10(1): 42-50; 1973.* (25 references)

Results of an investigation of the effects of DDT, dieldrin, and Aroclor 1221, alone or in combination, on serum proteins in rabbits indicate a moderation of the activity of the immunological system by organochlorines. The IgG fraction of γ-globulins was slightly reduced after one and two months of organochlorine administration and was most pronounced with Aroclor 1221. Groups which received two organochlorines simultaneously had the lowest serum levels of IgM fraction of γ-globulins. DDT and dieldrin produced a rise in albumin during the first month; Aroclor 1221 alone or in combination with DDT or dieldrin led to a decrease in serum albumin after three months. Increases in plasma levels of various organochlorines found in the food were observed after administration of each of the test compounds; weight gain was inhibited in some cases.

73-2670. Chinn, S. H. F. (Res. Sta., Can. Dept. Agr., Saskatoon, Saskatchewan, Canada). **Effect of eight**

fungicides on microbial activities in soil as measured by a bioassay method. *Can. J. Microbiol. 19(7): 771-777; 1973.* (17 references)

Eight fungicides used in soil treatments were assayed for their effect against three species of bacteria, two of actinomycetes, and three of fungi at intervals over a 32-week period. Methylmercury dicyandiamide (MMDD) was the only fungicide that showed some inhibitory effect at 1 ppm. MMDD and Hoe 2874 were the most effective fungicides, followed by Chemagro B1843, thiram, and maneb in decreasing order of effectiveness. Captan with low solubility and two insoluble fungicides showed little or no activity. No fungicide at 1 or 10 ppm persisted for over 3 weeks. At 100 and 1000 ppm some fungicides persisted for periods extending beyond 32 weeks. The eight fungicides differed both quantitatively and qualitatively in their ability to inhibit or stimulate the various test organisms. The method is described and the effect of fungicides in soil treatment on the general microflora besides the soil pathogens is discussed. (Author abstract by permission)

73-2671. Sathaiah, V.; Reddy, P. V. (Dept. Bot. Zool., Government Coll., Jagtial, A.P., India). **Chromosome spreading by zinc ethelene *[sic]* bisdithiocarbamate "Zineb Ciba".** *Curr. Sci. 42(4): 143-144; 1973.* (2 references)

In the preliminary investigation of the cytological effects of "Zineb Ciba" on the root tips of *Allium cepa*, the predominant observable effect was C-mitotic action. Exposure to concentrations between 0.25 and 0.5% for 4-6 hr at room temperature produced this effect. Extensive cell death was observed at concentrations as low as 0.1% with maximum exposure times of eight hours.

73-2672. Purushothaman, D.; Balaraman, K.; Oblisami, G. (Microbiol. Lab., Tamil Nadu Agr. Univ., Coimbatore-641003, Tamil Nadu, India). **Indole acetic acid metabolism in soil as influenced by pesticide application.** *Curr. Sci. 42(10): 365-366; 1973.* (7 references)

The amount of indole acetic acid (IAA) recovered from soil fortified with tryptophan and glucose was reduced in the presence of 0.1 to 0.4% Anthio (formothion), 50 to 200 ppm Benlate (benomyl), 50 to 200 ppm Brassicol (pentachloronitrobenzene) and 10,000 ppm streptomycin sulfate. The reductions were greatest with Anthio and with streptomycin, indicating that bacteria play an important role in IAA production. Control soil containing glucose yielded about one sixth the IAA found in soil fortified with tryptophan and glucose. The level of IAA in soil is generally maintained at an equilibrium despite temporary fluctuations caused by soil treatments since IAA–destroying microorganisms are also present.

73-2673. Armstrong, T. F. (Michigan State Univ., East Lansing, MI). **Factors affecting the response of yellow nutsedge (*Cyperus esculentus* L.) to 2-chloro-2′,6′-diethyl-*N*-(methoxymethyl) acetanilide (alachlor).** *Diss. Abstr. Int. 33(11): 5094B; 1973.*

Preplant or preemergence applications of alachlor at 3.36 or 4.48 kg/ha effectively controlled yellow nutsedge in field and greenhouse studies. Depth of tubers in the soil did not affect nutsedge response to alachlor. Alachlor at 3.36 kg/ha did not effectively control yellow nutsedge in soils with more than 6% organic matter. Alachlor at $3.7 \times 10^{-6} M$ and $18.5 \times 10^{-5} M$ inhibited growth and killed newly emerging shoots in Petri dish cultures. However, alachlor did not inhibit sprouting of yellow nutsedge tubers. The main site of uptake of alachlor by small yellow nutsedge plants is the tissue above the tuber. Primarily acropetal and some basipetal ^{14}C-translocation occurred from ^{14}C-alachlor applications to small seedlings with 2 to 4 cm shoots. Alachlor is metabolized rapidly in yellow nutsedge to at least one water-soluble metabolite. Applications of ^{14}C-alachlor to 15 cm shoots resulted in limited acropetal ^{14}C-translocation. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-12,663.)

73-2674. Derr, S. K. (Michigan State Univ., East Lansing, MI). **Biologically active compounds in the aquatic environment: a study of two environmental contaminants, DDE and Aroclor 1254, on the aquatic midge, *Chironomus tentans*.** *Diss. Abstr. Int. 33(11): 5326B; 1973.*

Aquatic midges were exposed from egg through adult to 0.07-2.2 ppm of DDE, and the amount of DDE accumulated was determined by gas-liquid partition chromatography. Laboratory studies were confirmed by field studies. DDE accumulation by the midge was dose-dependent, increasing exponentially with increasing concentration for a given exposure time. The midges concentrated DDE approximately 15,000 times over the level present in the water. Metabolism of *p,p′*-DDE was not detected. Exuvia were not a major route of residue elimination. Egg deposition removed 12-31% of the DDE residue burden from the female. The number of second generation emerging adults was reduced. The presence of the polychlorinated biphenyl Aroclor 1254 did not affect DDE uptake. The half-life of DDE in the larvae was 6.8 days. Dead and live larvae took up equal amounts of DDE from solution, and DDE uptake was correlated with cuticle surface area, indicating an adsorption-diffusion mechanism. Increased calcium and magnesium ion concentrations in the water resulted in increased DDE uptake. The possibility of capturing emerging chironomids as a mechanism for pesticide removal from sewage oxidation ponds is discussed. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-12,700.)

73-2675. Stalling, D. L.; Hogan, J. W.; Johnson, J. L. (Fish-Pestic. Res. Lab., Bureau Sport Fish. and Wildl., U.

S. Dept. Interior, Columbia, MO 65201). **Phthalate ester residues – their metabolism and analysis in fish.** *Environ. Health Perspect. 3: 159-173; 1973.* (17 references)

Studies were conducted to analyze the interaction of phthalate esters with aquatic organisms. Analytical methods were developed for GLC determination of residues associated with the presence of phthalate esters in the environment. Phthalate ester and metabolite identities were confirmed by GLC-mass spectrometry and computer processing of spectral information. Radioactive metabolites in whole-body extracts of channel catfish exposed to 1 μg/l. of di-2-ethylhexyl phthalate (dioctyl phthalate, DEHP) for 24 hr included 14% DEHP, 66% mono-2-ethylhexyl phthalate, 4% phthalic acid, 14% conjugates, and 2% other compounds, corresponding to a total residue level of 2.6 ppm DEHP. Slightly different metabolite ratios were obtained using the fathead minnow. Incubation of labeled phthalates with microsomal preparations from channel catfish liver in vitro resulted in formation of three unidentified metabolite types, as well as the appropriate monoester. Formation of the unidentified metabolites was inhibited by the presence of carbon monoxide or a lack of NADPH. Enzymatic degradation of DBP (di-*n*-butyl phthalate) was 97% complete within two hours, whereas only 6% of DEHP was degraded in this time. Trace amounts to 500 ppb of DBP and 5 to 3200 ppb of DEHP were found, along with PCB and organochlorine insecticide residues, in fish and other organisms from various rivers. Water and dietary components were contaminated with phthalate esters.

73-2676. Metcalf, R. L.; Kapoor, I. P.; Lu, P. Y.; Schuth, C. K.; Sherman, P. (Dept. Entomol., School Life Sci., Univ. Illinois, Urbana-Champaign, IL 61801). **Model ecosystem studies of the environmental fate of six organochlorine pesticides.** *Environ. Health Perspect. 4: 35-44; 1973.* (18 references)

Results of investigations with six organochlorines in a previously described laboratory model ecosystem suggest that the system will be useful for evaluating the environmental toxicology of new candidate pesticides. Endrin, at concentrations in the water of 1 to 2 ppb, was highly toxic to the organisms involved. The toxicity provided a striking parallel to Mississippi River fish kills associated with the pesticide. Aldrin was rapidly and nearly completely converted to dieldrin which was stored in the various organisms, and degradation of dieldrin was similar to that found in the rat and in the sheep. Mirex was one of the most stable pesticides evaluated in the model ecosystem. Lindane was considerably more biodegradable than the cyclodienes, and hexachlorobenzene remained primarily intact although highly polar metabolites and conjugates of this pesticide were found. Biological accumulation of these compounds in tissues of fish and snail was from 200 to 84,000 times greater than in water. A definite inverse relationship was obtained between levels of ecological magnification and water solubility.

73-2677. Pritchard, J. B.; Guarino, A. M.; Kinter, W. B. (Dept. Physiol., Med. Univ. S. Carolina, Charleston, SC 29401). **Distribution, metabolism, and excretion of DDT and mirex by a marine teleost, the winter flounder.** *Environ. Health Perspect. 4: 45-54; 1973.* (28 references)

Labeled DDT injected intravenously in white flounder in an amount equivalent to the background level of total DDT in the fish (0.1 mg/kg) exhibited three different plasma half-lives (5 min., 2.25 hrs., and 10 days) which reflected uptake, redistribution, and slower redistribution and/or excretion. Mirex curves obtained after the same treatment had only two components and the final half-life was eight days. In both cases the ultimate sink for the pesticide appeared to be the carcass, primarily the muscle, but accumulation of mirex in the carcass was slower. Total lipid concentration in tissue did not affect initial uptake, although ultimate distribution of DDT may more closely reflect lipid levels. Excretion of both pesticides was very low by all routes. No evidence of mirex metabolism and very little DDT metabolism were observed.

73-2678. Piver, W. T. (Nat. Inst. Environ. Health Sci., P. O. Box 1233, Research Triangle Park, NC 27709). **Organotin compounds: industrial applications and biological investigation.** *Environ. Health Perspect. 4: 61-79; 1973.* (41 references)

Much of the toxicological investigation of organotin compounds has centered on the trialkyl-, triaryl-, and tetraalkyltin derivatives which are mainly used as biocides. With the exception of the acute oral toxicity (to the rat) for the trimethyl derivative, the toxicity of trialkyltin compounds decreases with increasing size and stability of the ligand. Guinea pig was more susceptible than the rat or rabbit, and the most toxic compound tested was triethyltin sulfate, which had an oral LD50 of 5 to 10 mg/kg. Muscular weakness was the main symptom of chronic poisoning, but there was no evidence of concentration of tin in any organ. A reversible accumulation of fluid in the white matter of the brain was observed. Bis-(tri-*n*-butyltin) oxide, administered in low concentrations on the eye of rabbits, had a very pronounced and irreversible effect on normal eye function and, administered in higher concentrations, resulted in death. Trimethyltin derivatives inhibited oxidative phosphorylation in rat liver mitochondria.

73-2679. Lundberg, C. (Inst. Zoophysiol., Box 560 S-75122 Uppsala, Sweden). **Effects of long-term exposure to DDT on the oestrus cycle and the frequency of implanted ova in the mouse.** *Environ. Physiol. Biochem. 3(3): 127-131; 1973.* (17 references)

Lengthened estrus cycles were observed in female mice treated orally with DDT at 0.05 mg/day. A lower

frequency of implanted ova than in controls was found when these animals were caged with males and treatment continued for 12 days. The period of sexual receptivity of each cycle was not prolonged due to suspected estrogenic effects of DDT. Lengthening of the cycle and the decrease in the number of ova may have resulted from action of DDT on two mechanisms, perhaps estradiol and progesterone metabolism; previous reports indicated that polychlorinated biphenyls affected one parameter and DDT the other. Levels of DDT and its metabolites were comparable with those found in animals in the natural state and ranged from 0.40 to 2.20 ppm in liver tissue. Almost half of the residue was *p,p'*-DDD (TDE).

73-2680. Konat, G.; Clausen, J. (Neurochem. Inst., 58 Raadmandsgade, DK-2200 Copenhagen N, Denmark). **The cytochrome P-450 complex and esterase of the liver and brain in lindane, Aroclor 1254, and DDT-induced intoxication of the mouse.** *Environ. Physiol. Biochem. 3(3): 139-147; 1973.* (39 references)

Aroclor 1254, lindane, and DDT, administered to mice for seven days at 1500, 1200, and 2100 ppm, respectively, in the diet significantly increased liver cytochrome P-450 and mixed function oxidase activities, the first having the greatest and the last the weakest effect. The doses were such that an equivalent amount of chlorine was given with each compound and resulted in 50% mortality of the animals after two days of starvation. Aroclor 1254, the only compound to increase liver weight significantly, caused a 360% induction of cytochrome P-450 content, and lindane and DDT elevated the total P-450 content by 93% and 76%, respectively. No correlation was found between total P-450 levels and total drug transformation activity. Demethylation and hydroxylation increased by 213 and 290%, 180 and 184%, and 74 and 113% after treatment with Aroclor 1254, lindane, and DDT, respectively. Lindane and Aroclor elevated the total activity of microsomal esterases while DDT did not. No effects were observed in brain cytoplasmic esterases with any of the chlorinated compounds, suggesting that brain tissue is not involved in the detoxication process.

73-2681. Kacew, S.; Singhal, R. L. (Dep. Pharmacol., Fac. Med., Univ. Ottawa, Ottawa, Canada). **Acute DDT toxicity: comparative metabolic changes in normal and hypophysectomized rats.** *Environ. Physiol. Biochem. 3(3): 148-153; 1973.* (12 references)

DDT at 100 and 200 mg/kg significantly increased activities of pyruvate carboxylase, phosphoenolpyruvate carboxykinase, fructose 1,6-diphosphatase, and glucose 6-phosphatase, the 4 key enzymes in the pathway of gluconeogenesis in liver and kidney cortex, in tissues of normal rats. In hypophysectomized Sprague-Dawley rats, an increase was observed with the 200 mg/kg dose, but not with the 100 mg/kg dose. Since DDT has been shown to affect growth and reproduction and since the pituitary secretes hormones that influence growth and reproduction, it is possible that the DDT-induced enhancement of gluconeogenic enzymes is related to pituitary hormone function.

73-2682. Isensee, A. R.; Kearney, P. C.; Woolson, E. A.; Jones, G. E.; Williams, V. P. (Agr. Environ. Qual. Inst., Agr. Res. Cent., ARS, U.S. Dept. Agr., Beltsville, MD 20705). **Distribution of alkyl arsenicals in model ecosystem.** *Environ. Sci. Technol. 7(9): 841-845; 1973.* (13 references)

Distribution of ^{14}C-labeled cacodylic acid (CA) and dimethylarsine (DMA) among aquatic organisms in a model ecosystem was studied. Fish, *Daphnia magna*, snails, and algae were exposed to CA and DMA for 3, 29, 32, and 32 days, respectively. Lower food chain organisms (algae and *Daphnia*) bioaccumulated more CA and DMA than did higher food chain organisms (snails and fish). Amounts accumulated indicate that CA and DMA do not show a high potential to biomagnify in the environment. An increase in biomass (primarily algae) over 32 days largely accounted for a gradual loss of CA and DMA from solution. (Author abstract reprinted by permission of the American Chemical Society)

73-2683. Silbergeld, E. K. (Stroud Water Res. Cent., Dept. Limnol., Acad. Natur. Sci. Philadelphia, Avondale, PA 19311). **Dieldrin. Effects of chronic sublethal exposure on adaptation to thermal stress in freshwater fish.** *Environ. Sci. Technol. 7(9): 846-849; 1973.* (31 references)

The freshwater fish, *Etheostoma nigrum*, were pretreated with 2.3 ppb dieldrin for 30 days and then exposed to thermal stress, applied by heating the water at a rate of 1°C/hr to a maximum of 7-9°C above ambient temperature. Pretreated fish had significantly higher mortality than fish not pretreated with dieldrin but also exposed to the same thermal stress. Measurements of blood glucose, feeding, growth, oxygen consumption, opercular movement, whole body lipid content, and liver condition were made throughout the experiment. Pretreated fish demonstrated significant changes in all of the above parameters except opercular movement during the first 15 days of exposure to dieldrin. After 15 days, pretreated fish were found to have adapted to dieldrin exposure, as indicated by significant reversals of the above changes (except for liver damage, which was not reversed but progressed over time). In the adapted state, the pretreated fish remained different from untreated fish, in terms of these parameters. These differences provide grounds for predicting differential response to sublethal thermal stress for the pretreated and untreated fish. Such response is discussed as it may relate to the effects of chronic sublethal exposure to dieldrin. (Author abstract reprinted by permission of the American Chemical Society)

73-2684. De Frenne, E.; Eberspaecher, J.; Lingens, F. (Inst. Mikrobiol. Molekularbiol. Univ. Hohenheim, Stuttgart-Hohenheim, Germany). **The bacterial degradation of 5-amino-4-chloro-2-phenyl-3(2*H*)-pyridazinone.** *Eur. J. Biochem. 33(2): 357-363; 1973.* (17 references)

Soil bacteria capable of utilizing pyrazon as the sole source of carbon metabolized the herbicide to 5-amino-4-chloro-2-(2,3-*cis*-dihydroxy-cyclohexa-4,6-diene-1-yl) 3(2*H*)-pyridazinone (I), 2-(5-amino-4-chloro-3-oxo-2,3-dihydro-2-pyridazino)-*cis,cis*-muconic acid (II), 2-pyrone-6-carboxylic acid (III), and 5-amino-4-chloro-3(2*H*)-pyridazinone (IV). Compound I was detected 30 hr after inoculation and reached a maximum at 38 to 40 hr. Compounds II and III appeared about 30 hr after inoculation, and maximum concentrations were observed at about 50 hr; compound IV, detected at 20 hr, continue' to increase. Only compound I and its decomposition products could be utilized as carbon sources by the bacteria, and no microorganisms have been isolated which can metabolize IV. Cell-free extracts of the pyrazon-degrading bacteria exhibited 2-hydroxymuconic acid decarboxylase activity, supporting the proposal that the acid could be a product of the metabolism of II and be rapidly removed.

73-2685. Reid, W. D.; Krishna, G. (Exective Off. President, Special Action Off. Drug Abuse Prevention, Washington, DC 20506). **Centrolobular hepatic necrosis related to covalent binding of metabolites of halogenated aromatic hydrocarbons.** *Exp. Mol. Pathol. 18(1): 80-99; 1973.* (58 references)

A considerable amount of radioactivity was bound to protein of liver and kidney after 24 hr, when ^{14}C-bromobenzene was administered at 4.8 moles/kg to mice. Lung and plasma also contained significant amounts of labeled materials, and the distribution of binding following the distribution of microsomal cytochrome P-450 drug-metabolizing enzyme activity. Histopathological changes began to appear in the centrolobular areas of the liver at 12 to 16 hr, when maximum binding was observed, and necrotic centrolobular hepatocytes accumulated most of the covalently bound material. Piperonyl butoxide, an inhibitor of drug-metabolizing enzymes, reduced the amount of bound radioactive material in the liver 5 to 12 hr after ^{14}C-bromobenzene administration by 80%. A 20-fold increase in covalent binding was observed when mice were pretreated with phenobarbital. From these results, it appears that a toxic metabolite of the halogenated hydrocarbon was being bound by the protein. A much greater binding took place when hepatotoxic compounds were administered to rats than when non-toxic derivatives like fluoro- and *para*-dichloro-benzenes were given.

73-2686. Walker, A. I. T.; Thorpe, E.; Stevenson, D. E. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The toxicology of dieldrin (HEOD). I. Long-term oral toxicity studies in mice.** *Food Cosmet. Toxicol. 11(3): 415-432; 1973.* (21 references)

Dieldrin, *p,p'*-DDT, and a combination of these two compounds were fed to CF1 mice at various dietary concentrations. In a positive control group fed 600 ppm 4-amino-2,3-dimethylazobenzene (ADAB), 61% of the males developed sarcomas while pathological changes in the liver were the predominant lesions in the females. No signs of ill-health were associated with the feeding of dieldrin at levels of 10 ppm or less, or of DDT at levels at or below 100 ppm. In mice fed dieldrin, liver enlargement was detectable after 9 months of treatment with 10 ppm, after 19 months with 5 ppm and after 23 months with 2.5 ppm and was associated with a decrease in survival rate. At intakes of 1.25 and 1 ppm dieldrin, no enlargement was detected clinically and survival was not affected. With DDT, liver enlargement was detected in the 100-ppm group after 16 months and morbidity was increased. In the 50-ppm group, enlargement occurred after 24 months, but morbidity was not affected. The method of diet sterilization did not influence the development of liver lesions. Liver lesions observed in all the groups, including controls, were classed as either simple nodular growths of liver parenchymal cells or areas of papilliform and adenoid growth of tumor cells. The incidence of other tumors was increased in ADAB-treated mice but not in the dieldrin or DDT groups. (Author abstract by permission, abridged)

73-2687. Thorpe, E.; Walker, A. I. T. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The toxicology of dieldrin (HEOD). II. Comparative long-term oral toxicity studies in mice with dieldrin, DDT, phenobarbitone, β-BHC, and γ-BHC.** *Food Cosmet. Toxicol. 11(3): 433-442; 1973.* (23 references)

A 2-yr oral toxicity study has been completed in which dieldrin (purity > 99% HEOD), *p,p'*-DDT (purity > 99.5%), β-BHC (purity > 99%), γ-BHC (lindane) (purity > 99.5%) and phenobarbitone (purity not less than 98%) were fed to CF1 mice at different dietary concentrations. The experiment was designed to study the development of liver changes in CF1 mice fed compounds known to cause hepatic microsomal-enzyme induction. Liver enlargement was detected after 50 wk in both sexes given dieldrin (10 ppm) or δ-BHC (400 ppm) and in females fed DDT (100 ppm) or β-BHC (200 ppm), after 60 wk in males given β-BHC (200 ppm) and after 68 wk in males given DDT (100 ppm) and in males and females given phenobarbitone (500 ppm). Liver lesions observed in all groups were classified as hyperplastic foci, type (a) a simple nodular growth of parenchymal cells and type (b) with areas of papilliform and adenoid growth of tumor cells, sometimes associated with lung metastases. The problem of the classification and diagnosis of type (a) and (b) growths is considered. In addition, the biological significance of the induction of liver tumors in mice and the importance of liver cell

hyperplasia are discussed. (Author abstract by permission)

73-2688. Matveyeva, V. G.; Kerkis, Yu. Ya.; Ekshtat, B. Ya. (Inst. Cytol., Siber. Branch Acad. Sci. USSR, Novosibirsk, USSR). **Mutagennyy effekt pestitsida DDB v kletkakh kostnogo mozga mlekopitayushchikh pri dlitel'nom vvedenii. [The mutagenic effect of DDB in prolonged administration in mammalian bone marrow cells.]** *Gig. Sanit. 38(1): 94-97; 1973.* (12 references) (Russian)

DDB (a soil fumigant containing 48.7% 1,3-dichloroisobutane, 35.7% 1,3-dichloroisobutylene, and 3,3-dichloroisobutylene) was tested for mutagenic effect on bone marrow cells in mice fed daily doses of 10 mg/kg for 20 days and rats fed daily doses of 0.25, 1.2, and 6 mg/kg for 8 months. The frequency of chromosome aberrations significantly increased in mice starting from the 5th day of DDB administration. The respective frequencies of chromosomal aberrations, measured on the 5th, 15th and 20th days of the experiment, were 6.5±0.7%, 10±0.9%, and 9.8±1%. The frequency of cells with chromosomal aberrations normalized in 10 days after the administration of DDB. The frequency of chromosomal aberrations in rats fed 1.2 and 6 mg/kg doses of DDB were 6.5±0.6% and 67 ±0.7%, respectively; 0.25 mg/kg doses did not cause an increase in this parameter. The mitotic activity in the bone marrow did not change in mice and rats.

73-2689. Lazutka, F. A. (Sci. Res. Inst. Exp. Clin. Med., Vilnyus, USSR). **Toksichnost' anabazin-sul'fata i tiofosa pri ikh kombinirovannom deystvii na organizm. [Toxicity of anabasine sulfate/parathion combinations on the organism.]** *Gig. Sanit. 38(2): 98-100; 1973.* (7 references) (Russian)

The oral and inhalatory toxicities of anabasine sulfate, parathion, and combinations of the two were studied in acute and chronic poisoning tests with albino rats. The oral LD50 values of anabasine sulfate and parathion, determined in an acute poisoning test, are 15.9 and 210 mg/kg, respectively. The LD50 value determined for mixtures of equal proportions of anabasine sulfate and parathion is 19 mg/kg. Except for a reduction of the cholinesterase activity, poisoning symptoms and biochemical changes in the blood were not detected in rats which inhaled mixtures of 0.15 or 0.26 mg/m^3 of anabasine sulfate with 0.1 or 0.2 mg/m^3 of parathion for six months.

73-2690. Aleksashina, Z. A.; Buslovich, S. Yu.; Kolosovskaya, V. M. (Belorussian Sci. Res. Inst. Sanit. Hyg., Minsk, USSR). **Embriotoksicheskoye deystviye dietilaminnoy soli 2,4-D. [Embryotoxic effect of 2,4-D diethylamine salt.]** *Gig. Sanit. 38(2): 100-101; 1973.* (3 references) (Russian)

The embryotoxic effect of single, large doses and of small, repeated doses of the 2,4-D diethylamine salt was studied in female albino rats. One group was given 50% of the LD50 of 2,4-D diethylamine salt intragastrically on the 4th, 5th, 6th, 9th, 10th, 11th, 13th, 14th and 15th days of pregnancy and decapitated on the 19th day. The number of embryos in animals to which 2,4-D diethylamine salt was administered on the 5th and 9th days of pregnancy decreased significantly. Administration of the pesticide on the 5th, 9th, 10th and 13th days of pregnancy increased rate of intrauterine death and reduced fetal weight. Rats poisoned on the 4th, 6th, 9th and 13th days of pregnancy had increased lumens of the cerebral ventricles and fetuses had hemorrhages in the abdominal cavity. Another two groups were given 0.5 and 0.1 mg/kg per day until decapitation on the 19th day of pregnancy. There was no difference between these groups and a control group with respect to intrauterine and preimplantational death or number of embryos; fetuses from the 0.5 mg/kg group had reduced weight and length. Hyperemia of the fetal blood vessels and a few cases of hemorrhage in the abdominal cavity were observed.

73-2691. Kalashnikov, V. P.; Tarnopol'skiy, L. S. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occupat. Dis., Tashkent, USSR). **Izucheniye deystviya ingalyatsionnoy zatravki razlichnymi kontsentratsiyami smesi TKhFM i TMTD na funktsional'noye sostoyaniye shchitovidnoy zhelezy pri pomoshchi radioaktivnogo yoda (I^{131}). [Effects of copper trichlorophenolate and thiram inhalation on thyroid function, determined by radioiodine uptake.]** *Gig. Sanit. 38 (2):113-114; 1973.* (2 references) (Russian)

Rabbits and rats were exposed to 1.17, 5.4, 11.3, and 31.9 mg/m^3 concentrations of copper trichlorophenolate-thiram mixtures six times, 4 hr weekly for four months. The effects of these pesticides on thyroid function were determined by radioiodine uptake. The 1.17 mg/m^3 concentration caused hyperfunction of the thyroid gland, as determined from the increased rate of incorporation, and retarded elimination of radioiodine. Concentrations of 5.4, 11.3, and 31.9 mg/m^3 produced thyroid hypofunction, evidenced by the reduced rate of incorporation and increased rate of elimination of radioactive iodine. The occurrence of endemic goiter in several parts of Uzbekistan requires systematic screenings to prevent subjects with thyroid insufficiency from handling and applying copper trichlorophenolate and thiram.

73-2692. Trubnikova, T. I. (Saratov Sci. Res. Inst. Rural Hyg., Saratov, USSR). **Toksikologicheskaya i gigiyenicheskaya kharakteristika gerbitsida semerona. [Toxicologic and hygienic characteristics of the herbicide desmetryne.]** *Gig. Sanit. 38 (3): 33-36; 1973.*(3 references) (Russian)

Toxicological experiments were performed with Semeron (desmetryne) on rats, mice, and rabbits. The LD50 value, determined for rats and mice in acute poisoning tests, is 2,000±280 and 700±160 mg/kg, respectively. Prolonged administration of 1/10 and 1/20 LD50 doses produced poisoning symptoms: disturbances in the function of the central nervous system; reduced hemoglobin, leukocyte and neutrophil counts in the blood; reduced hippuric acid level in the urine; pronounced venous congestion of parenchymal organs and the cerebrum and cerebral membranes; hemorrhages of the mucosa; and dystrophic degenerations in the liver, kidney, and cerebral ganglia. Slight local irritation, but no poisoning symptoms, with skin application of single or repeated 500 mg/kg doses was observed on rabbits. Weakly expressed cumulative properties and low toxicity were determined. The recommended maximum allowable workplace concentration of desmetryne is 2 mg/m^3.

73-2693. Novakova, S.; Dinoyeva, S.; Danon, S. (United Sci. Res. Inst. Hyg. Accident Prevention, Sofia, Bulgaria). **Eksperimental'noye obosnovaniye predel'no dopustimoy kontsentratsii patorana v voda vodoyemov. [Experimental confirmation of maximum allowable concentration of patoran in reservoir water.]** *Gig. Sanit. 38(3): 86-89; 1973.* (2 references) (Russian)

Sanitary and toxicological studies for the substantiation of the maximum allowable concentration of patoran (metobromuron) in reservoir water are described. An LD50 value of 3,875 mg/kg and a cumulation factor of 3 were determined in rats. Albino rats fed 40 or 80 mg of patoran per kg of body weight daily for six months developed leukocytosis with leukopenia, plethora of the spleen and liver, moderate dystrophy of parenchymal cells, and slight swelling of reticuloendothelial cells. Reduction of the cholinesterase, transaminase, acid and alkaline phosphatase, lactate and malate dehydrogenase, leucine amino peptidase, and aldolase activities was observed in the same groups. The ineffective dose was 0.01 mg/kg (2 mg/l.). The maximum allowable concentration of patoran in reservoir water, determined from the organoleptic properties of contaminated water, was set at 0.20 mg/l.

73-2694. Beemer, A. M.; Kuttin, E. S.; Greenfeld, S. (Israel Inst. Biol. Res., Ness-Ziona, Israel). **[An unusual case of dermatitis.]** *Harefuah 78(3): 112-113; 1970.* (13 references) (Hebrew)

A case report of an exotic form of dermatitis, successfully treated with lindane, is presented. The patient, a 23-year-old man, had severe irritation in the region of the groin and buttocks for 1.5 years. Treatment with antifungal ointments did not afford relief. Scrapings from the feet, where the skin was desquamating between the toes, revealed hyphae of *Trichophyton mentagrophytes*. No fungi were found in scrapings from the groin, but specimens and fragments of a mite were seen. The mite was identified as *Amblyseius barkeri* (Hughes), a species which is normally found only on plants. It was suggested that the mite lived on the fungus which was originally responsible for the irritation, and persisted in situ after the fungus was eliminated. The mite infestation was cured by application of lindane lotion. (From author abstract)

73-2695. Aldridge, W. N. (Author address not given). **Nature of the reaction of organophosphorus compounds and carbamates with esterases.** *Hoppe-Seylers Z. Physiol. Chem. 354(1): 4-5; 1973.* (17 references)

Esterases which undergo time and temperature dependent inhibition by organophosphates (called B-esterases) evidently combine with these compounds in an enzyme-substrate reaction. The general reaction includes a reversible combination followed by an irreversible separation of the enzyme-ester moiety and its hydrolysis to the free acid and enzyme. The best inhibitors are those which lead to a rapid release of the dephosphorylated compound and phosphoric acid, suggesting that effects must be on formation of the Michaelis complex or its breakdown. The fact that there are some phosphorylated and carbamylated B-esterases which have a measurable rate of hydrolysis and the fact that there are stable carbamyl-B-esterases support the analogy with substrates. Serine has been the active site in all cases studied. Aging, in which dialkylphosphorylated or dialkylphosphonylated cholinesterases are dealkylated to give monoalkyl derivatives, is the only reaction of organophosphorus compounds which does not have a substrate analogy.

73-2696. Ziegler, A.; Wassermann, O. (Hospitalstrasse, Kiel, Germany). **Die Reaktivitaet der Acetylcholinesterase in vivo und in vitro unter dem Einfluss bisquartaerer Ammoniumverbindungen. [The in vivo and in vitro reactivity of acetylcholinesterase under the influence of bisquaternary ammonium compounds.]** *Hoppe-Seylers Z. Physiol. Chem. 354(1): 5-6; 1973.* (German)

Theoretically, organophosphate poisoning, which results in excessive accumulation of acetylcholine, should be treatable with a combination of acetylcholine antagonists and phosphorylated enzyme reactivators. Results with such a combination in vivo have been disappointing. Better results were obtained in animal experiments using a hexamethonium derivative such as hexamethylenebis(dimethyl-(3-phthalimidopropyl) ammonium) with the reactivator. A clear correlation was discovered between the binding strengths of the hexamethonium compounds to various organs in vitro and their protective effects in vivo. Not only the affinity of the compounds for the nicotinic receptors, but also the adhesiveness to the tissue itself seems to play a role in determining effectiveness. Previous therapeutic efforts thus seem to have been based on protection of peri-

pheral acetylcholine receptors, and have not utilized the possibilities of modifying the reactivity of the esterase or effectively protecting central nervous system receptors. The search for drugs capable of fulfilling these possibilities should be continued.

73-2697. Johnson, M. K. (Med. Res. Council Unit, Woodmansterne Rd., Carshalton, Surrey, England). **Brain "neurotoxic esterase".** *Hoppe-Seylers Z. Physiol. Chem. 354(1): 6-7; 1973.*

Studies performed to account for the delayed neurotoxic effects produced by some, not all, organophosphorus esters are reviewed. The neurotoxic compounds are not necessarily potent acetylcholinesterase inhibitors, but they are esterase inhibitors. A characteristic "neurotoxic phosphorylation site", which is always phosphorylated in the presence of neurotoxic compounds in hens, was identified by preincubating hen brain homogenate with various inhibitors before labeling with ^{32}P-DFP. Labeling of this site is prevented in vitro only by phenyl phenylacetate. Hydrolysis of phenyl phenylacetate by hen brain homogenate in vitro is due to at least 5 enzymes, and 3% of the hydrolytic activity is paraoxon-resistant and Mipafox-sensitive. The esterase with this activity has been designated "neurotoxic esterase", and appears identical to the "neurotoxic phosphorylation site". Injection of sulfonyl and phosphinyl esters inhibits "neurotoxic esterase", and protects hens completely against the neurotoxic effects of DFP or mono-*o*-cresyl diphenyl phosphate given within the next 6-7 days. Nervous tissue is not damaged merely as a result of loss of "neurotoxic esterase" activity, but binding of an inhibitor at the active site of this esterase could damage the protein or its environment. Neurotoxic compounds are those which could hypothetically undergo a secondary reaction, analogous to aging of cholinesterase, to leave an acidic group bound to the enzyme.

73-2698. Geldmacher-von Mallinckrodt, M.; Petenyi, M.; Fluegel, M.; Burgis, H.; Dietzel, B.; Metzner, H.; Nirschl, H.; Renner, O. (Inst. Rechtsmed., Univ. Erlangen-Nuernberg, D-8520 Erlangen, Germany). **Zur Spezifitaet der menschlichen Serum-Paraoxonase. [Specificity of human serum paraoxonase.]** *Hoppe-Seylers Z. Physiol. Chem. 354(3): 337-340; 1973.* (13 references) (German)

The Enzyme Commission's report of 1964 designated paraoxonase as a non-preferred name for arylester hydrolase, and therefore implied that paraoxonase is a highly nonspecific enzyme. The polymorphism of paraoxonase (existence of several genetically determined activity level ranges) was used as a new criterion for the examination of human serum paraoxonase specificity. This enzyme hydrolyzes methyl paraoxon in the same manner as paraoxon, with identical activities and polymorphism. Hydrolysis of chloromethyl paraoxon is similar although the activity range is narrowed. Isopropyl paraoxon is not hydrolyzed. Absence of hydrolysis was also ascertained when the P=O group in the molecule was replaced by P=S as in parathion, methyl parathion, and chlorthion, as well as when the nitro group was located elsewhere than in *para*-position on the phenyl group. Because of its stochastic independence from the paraoxon-hydrolyzing activity, the cleavage of *n*-propyl paraoxon appears to be governed by another serum enzyme. The absence of polymorphism previously demonstrated for phenylacetate hydrolysis indicates that the enzyme responsible for this is different from paraoxonase.

73-2699. Imai, H.; Miyata, M.; Ishikawa, T. (Sch. Ophthalmol., Fac. Med., Kitasato Univ., Kanagawa Prefect., Japan). **[Retinal disturbances in rats due to single-dose administration of an organophosphate pesticide, fenthion.]** *Igaku No Ayumi (Progr. Med.) 86(1): 28-30; 1973.* (4 references) (Japanese)

Pairs of 39-day-old (200 g) Wistar rats were given single s.c. injections of 1, 5, 10, or 20 mg fenthion. Retinal disturbances were observed by electroretinography (ERG) and compared with those in 10 control rats. ERGs were taken four days after treatment when symptoms had become stabilized. Controls showed a negative a-wave followed by a large positive b-wave with four rhythmic wavelets. The group treated with 1 mg fenthion presented a supernormal ERG with greatly enlarged a- and b-waves and rhythmic wavelets. The group given 20 mg fenthion showed small a- and b-waves with occasional appearance of positive shoulders in the a-wave. The peaks were greatly broadened at the extrema, accompanied by a decrease in rhythmic wavelets. Thus low dose levels produced ERG patterns with shortened time intervals and increased amplitudes; at higher dose levels, there was a subnormal trend of the ERG with increased time factors. The facilitation which is a basic pharmacologic function of organophosphates appears in the ERG as well at the lower fenthion level; inhibition of function due to excessive accumulation of acetylcholine appears at higher levels. The maximum no-effect level of fenthion for the retina is less than 0.1 mg per rat, corresponding to 25 mg for a human adult. ERG examinations should be performed in suspected organophosphate poisoning cases.

73-2700. Miura, K.; Ino, T.; Iizuka, M.; (Nat. Inst. Anim. Health, Min. Agr. Forestry, Tokyo, Japan). **[Comparison of susceptibility of various strains of mice to acute toxicity of BHC.]** *Igaku To Seibutsugaku (Med. Biol.) 86(6): 391-396; 1973.* (7 references) (Japanese)

To elucidate the differences in susceptibility of different strains of mice to BHC, 250-8000 mg/kg of technical BHC or corresponding amounts of α-BHC and γ-BHC (lindane) standards were administered to mice by stomach tube. The test strains used were C3H/He,

C57BL/6, SS, AA, and CF1. Although mortality 12 hr after technical BHC treatment was relatively low in CF1 and SS mice, mortality within 144 hr after treatment was high. The lowest LD50 of 411 mg/kg was found in SS mice, followed by 500 mg/kg in CF1 mice (females in both cases). Mortality 12 hr after treatment was high in C3H/He and C57BL6 mice, but it was relatively low within 144 hr after treatment. The LD50 was 1414 mg/kg in C57BL/6 mice and 1459 mg/kg in C3H/He mice. The AA strain was moderately susceptible with an LD50 of 802 mg/kg. Pure γ-BHC produced rapid death with severe convulsions; α-BHC was very slow in onset of effect with symptoms of tremor, paralysis, and wasting. In another experiment, performed on DSD strain mice, no significant difference in susceptibility between sexes was recognized.

73-2701. Venkataraman, G. S.; Rajyalakshmi, B. (Indian Agr. Res. Inst., New Delhi, India). **Relative tolerance of nitrogen-fixing blue-green algae to pesticides.** *Indian J. Agr. Sci. 42(2): 119-121; 1972.* (11 references)

Although Ceresan M (granosan), Dithane (zineb), 2,4-D, dalapon, propazine, Cotoran (fluometuron), diuron, and linuron were tolerated at high levels by most of the 27 strains of nitrogen-fixing blue-green algae tested, there was a wide variation in the relative tolerances. Although most strains of *Anabaena* tolerated levels of 100 ppm Ceresan M, strain 310 did not grow at a concentration of 0.01 ppm Ceresan M. Six strains of *Nostoc* and one strain of *Anabaena* tolerated 2,000 ppm propazine while 1 ppm of this compound was lethal to three other strains. When used as a seeding material, algae should be chosen with the pesticide in mind, and several strains should be inoculated when more than one pesticide is to be applied.

73-2702. Gaur, A. C.; Pareek, R. P. (Div. Microbiol., Indian Agr. Res. Inst., New Delhi-12, India). **Tolerance of nitrification to DDT.** *Indian J. Entomol. 33(3): 368-370; 1971.* (8 references)

No significant differences were observed in the nitrification activity of soil samples to which DDT was added in concentration from 1 to 1000 ppm although the number of *Nitrosomonas* was reduced at 5 ppm and higher, and *Nitrobacter* was affected at 100 and 1000 ppm. The toxic action to both groups of nitrifiers was reduced by addition of farmyard manure. Within one week most of the added fertilizer was nitrified and within two weeks there was no detectable fertilizer in the soil.

73-2703. Poat, J. A.; Morris, D.; Munday, K. A. (Dept. Physiol. Biochem., Univ. Southampton, Southampton, England). **The effect of dietary morfamquat on mitochondrial function in rat kidney.** *Int. J. Biochem. 3(16): 378-382; 1972.* (7 references)

Three parameters of mitochondrial function, P:O ratios, respiration rates, and respiratory control indices, measured with suspensions of renal mitochondria from rats fed morfamquat at 0.015% of the diet for 20 wk, were significantly lower than in mitochondria prepared from controls. The yield of mitochondria was higher in treated rats, and treated rats weighed less than the controls. Using various inhibitors, the whole of the cytochrome chain was shown operating, indicating that the biochemical lesion was not restricted to one component of the mitochondrial electron transport system. The defective mitochondria were primarily in the medullary region since only one of the parameters, the respiratory rate, was significantly lower in experimental animals when whole kidney was used. The inhibition was only 25% as compared to 50% when medullary tissue was used.

73-2704. VanGelder, G. A.; Smith, R. M.; Buck, W. B. (College Vet. Med., Iowa State Univ., Ames, IA). **Behavioral toxicology: do toxicants alter behavior?** *Iowa State Univ. Vet. 34(1): 17-22; 1972.* (12 references)

Pesticide applicators and others occupationally exposed to these chemicals have experienced changes in sleep patterns, attitudes, and responsiveness. Studies have been performed by behavioral toxicologists to determine effects of specific pesticides on animal behavior for the purpose of predicting human responses. Dieldrin did not affect extinction of learning in sheep conditioned to avoid electric shock and on sheep learning ability with a maze. Other experiments have shown that dieldrin may interfere with the ability of sheep to learn a visual discrimination; dieldrin did have a definite dose-related effect on performance of an auditory detection task. An investigation is being conducted to determine the changes induced by dieldrin in squirrel monkeys which have developed a win-stay, lose-shift strategy during training.

73-2705. Ramu, A.; Drexler, H. (Dept. Pharmacol., Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). **Hyperglycemia in acute malathion intoxication in rats.** *Isr. J. Med. Sci. 9(5): 635-639; 1973.* (24 references)

Fasted rats treated with malathion at 2 g/kg, a dose which did not cause typical symptoms of poisoning, exhibited hyperglycemia and decreased serum ChE. Blood glucose reached a peak between 3 and 5 hours, and serum ChE levels dropped from 30 min to 6 hr after administration. Pretreatment with pentapyrrolidonium bitartrate (ganglion blocking agent) or reserpine and adrenalectomy in triamcinolone-treated rats did not abolish the hyperglycemia. Atropine, but not *N*-methylatropine, prevented the hyperglycemia evoked by malathion, suggesting that it is probably the result of activation of a central cholinergic rather than a peripheral muscarinic receptor.

73-2706. Hughes, Jr., H. C.; Lang, C. M. (Dept. Comp. Med., Coll. Med., Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey, PA 17033). **Effect of orally administered dichlorvos on demodectic mange in the dog.** *J. Amer. Vet. Med. Ass. 163(2): 142-143; 1973.* (5 references)

Demodectic mange was diagnosed in four beagle pups and six young mixed breed dogs. Hair in the affected areas was clipped, and the dogs were shampooed. Two of the beagles were treated by rubbing an oil solution of rotenone into the affected area once a day for six weeks. The other dogs were given three oral doses of dichlorvos, 30 mg/kg, once every two weeks. The affected areas enlarged and became more erythematous in the dogs treated with rotenone whereas improvement was noted within three weeks after the first dose of dichlorvos. Skin scrapings were negative for mites at six weeks, and hair regrowth was complete two months after the initial dichlorvos administration. Clinical signs of toxicity were not noted with either drug.

73-2707. Booth, G. M.; Yu, C. C.; Hansen, D. J. (Dept. Zool., Brigham Young Univ., Provo, UT 84601). **Fate, metabolism, and toxicity of 3-isopropyl-1*H*-2,1,3-benzothiadiazin-4(3*H*)-1-2,2-dioxide in a model ecosystem.** *J. Environ. Qual. 2(3): 408-411; 1973.* (4 references)

Bentazon (3-isopropyl-1*H*-2,1,3-benzothiadiazin-4(3*H*)-1-2,2-dioxide), a new experimental herbicide, was studied in a model ecosystem. The radioactivity could not be extracted from the water until the solution was acidified with HCl. HCl may be either releasing the parent materials from conjugates or it simply needs acidification before it can be extracted. The major metabolite found in the water was *N*-isopropyl anthranilic acid amide, but bentazon was also present in significant amounts. A fresh water crab (*Uca minax*) contained anthranilic acid, *N*-isopropyl anthranilic acid, and bentazon. The aquatic organisms did not accumulate the chemical to any significant degree, although the fresh water crab accumulated it 50 times over the amount found in the water. This was not considered large when compared to DDT. This compound generally does not pose a threat to aquatic food chains on the basis of toxicity and metabolism studies. These data are the first to be published on an experimental herbicide and suggest that the model ecosystem can be used as a tool for routine evaluation of herbicide biodegradability. (Author abstract by permission)

73-2708. Webb, P. W.; Brett, J. R. (Fish. Res. Bd. Can., Pac. Biol. Sta., Nanaimo, B. C., Canada). **Effects of sublethal concentrations of sodium pentachlorophenate on growth rate, food conversion efficiency, and swimming performance in underyearling sockeye salmon (*Oncorhynchus nerka*).** *J. Fish. Res. Bd. Can. 30(4): 499-507; 1973.* (19 references)

Tests were performed at 15°C, pH 6.8, and dissolved oxygen values of 90-100% air saturation. Growth rate and conversion efficiency were measured by feeding a ration level of 15% body dry weight/day to underyearling sockeye salmon (*Oncorhynchus nerka*) held at sodium pentachlorophenate (PCP) concentrations of 0, 1.14, 1.99, 3.49, 7.16, 13.60, 27.73, 31.57, and 47.18 ppb. Swimming performance was measured at PCP concentrations of 0, 7.21, 19.00, and 50.00 ppb. The 96-hr LC50 was 63 ppb PCP. Growth rate and conversion efficiency were almost equally affected by PCP, the EC50 values being 1.74 ppb for growth rate and 1.80 ppb for conversion efficiency. This is approximately 2.8% of the 96-hr LC50. Swimming performance was unaffected by PCP at the concentrations used. (Author abstract by permission)

73-2709. Symons, P. E. K. (Fish Res. Bd. Can., Biol. Sta., St. Andrews, N. B., Canada). **Behavior of young Atlantic salmon (*Salmo salar*) exposed to or force-fed fenitrothion, an organophosphate insecticide.** *J. Fish. Res. Bd. Can. 30(5): 651-655; 1973.* (11 references)

Exposure of young Atlantic salmon (*Salmo salar*) to 1.0 ppm fenitrothion for 15-16 hr caused a 50% decrease in the number holding territories 6 days following treatment. Some severely affected fish also swam stiffly and ceased feeding, but these effects disappeared within 48 hr following return to clean water. Territories were not reclaimed for approximately 2-3 weeks. Exposure to 0.1 ppm fenitrothion for 15-16 hr caused a lesser (20%) reduction in numbers of fish holding territories. When mealworms (*Tenebrio* sp.) injected with 2-5μl. pure (100%) fenitrothion were force-fed to young salmon, 50% were regurgitated 8-12 hr afterwards. Almost all mealworms containing 10-20μl. fenitrothion were regurgitated. The proportion of worms regurgitated remained constant during a week of daily force-feedings but, 24 hr after the third or fourth feeding, all fish except controls could be made to flex tetanically by rapping on the aquarium, and they made little attempt to escape a dipnet. (Author abstract by permission)

73-2710. Hantke, W. E.; Bradley, Jr., R. L. (Del Monte Corp. Res. Cent., Walnut Creek, CA 94598). **Effect of dieldrin on bacteria producing lactic acid.** *J. Milk Food Technol. 35(11): 655-658; 1972.* (14 references)

Five ppm dieldrin noticeably inhibited acid production by *Streptococcus lactis, S. cremoris,* and a mixed strain commercial culture in lactose broth and somewhat reduced production in whole and skim milk. Milk proteins, particularly α-lactalbumin, decreased the inhibition by dieldrin in lactose broth. These effects were seen during a 5-hr incubation, which approximates the time of acid production in the manufacture of certain fermented milk products. Washing cells removed only 30% of the pesticide associated with them, suggesting that adsorption takes place.

73-2711. Bishara, R. H.; Born, G. S.; Christian, J. E. (Anal. Development Dept., Eli Lilly Co., Indianapolis). **Radiotracer distribution and excretion study of chlorophenothane in rats.** *J. Pharm. Sci. 61(12): 1912-1916; 1972.* (49 references)

Intraperitoneal administration of ^{14}C-chlorophenothane (DDT) resulted in greater accumulation of the compound and its metabolites in lungs, spleen, liver, kidneys, and testes than oral administration, although route of administration did not affect urinary excretion. Highest residues were found in fat (2.26 to 3.86% of radioactivity administered per gram tissue). Fecal excretion was high (40%) in orally dosed rats and low (0.9%) in those dosed intraperitoneally, and very little activity was recovered in respired air. Two of the three rats dosed orally had tremors and some convulsions within two hours of administration; these symptoms persisted for six hours.

73-2712. Larsen, R. V.; Kirsch, L. E.; Shaw, S. M.; Christian, J. E.; Born, G. S.* (Bionucleonics Dept., School Pharm. Pharmacal Sci., Purdue Univ., Lafayette, IN 47907). **Excretion and tissue distribution of uniformly labeled ^{14}C-pentachlorophenol in rats.** *J. Pharm. Sci. 61(12): 2004-2006; 1972.* (9 references)

Urine was the principal excretion route of ^{14}C-pentachlorophenol (PCP) in the rat since 68.3% of the administered activity was recovered in the urine after 10 days. Two components of the retention curves yielded half-lives of 10 hours and 102 days. From 9.2% to 13.2% of the activity was recovered in the feces after 10 days and $< 0.04\%$ was detected in the respired air in the first 24 hours. Almost all of the activity in the blood was contained in the serum, suggesting that the compound and its metabolites are not bound to cellular constituents. Liver and kidney contained the highest residues. These were not affected by stress or difference of sex.

73-2713. Yurkevich, I. V.; Tolkachev, N. Z. (Voroshilovgrad Agr. Inst., Voroshilovgrad, USSR). **Vliyaniye raznykh doz 2,4-D i simazina na mikrofloru chernozema obyknovennogo. [Effect of different doses of 2,4-D and simazine on the microflora of standard chernozem.]** *Khim. Sel. Khoz. 10(9): 696-698; 1972.* (12 references) (Russian)

Effects of recommended and highly increased doses of 2,4-D and simazine were studied on the microflora of normal chernozem. Simazine doses of 4 kg/ha and 2,4-D doses of 2 kg/ha first reduced the total microflora sharply; rapid proliferation and normalization at the control level followed. The changes in the upper 10-cm layer of the soil occurred within 10 to 15 days. Composition of the soil microflora shifted in favor of the useful microflora, including *Azotobacter*, phosphorus bacteria, molds, and actinomycetes. A 4 kg/ha-dose of simazine increased the growth rate of *Azotobacter*. Simazine doses of 200 kg/ha and 2,4-D doses of 100 kg/ha, having caused radical changes in the soil microflora, were not effective 40 days after introduction. High doses inhibited phosphorus bacteria and *Azotobacter*, but had no detrimental effect on urobacteria or molds.

73-2714. Leshchev, V. V.; Kan, P. T.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Sanit., Moscow, USSR). **Dinamika nakopleniya ostatkov diazinona i dursbana v organizme telyat i ovets. [Dynamics of diazinon and Dursban residue accumulation in the organism of calves and sheep.]** *Khim. Sel. Khoz. 10(9): 704-706; 1972.* (2 references) (Russian)

The dynamics of the diazinon and Dursban (chlorpyrifos) residue accumulation was studied by gas chromatography in calves and sheep. Five days after calves were sprayed with an aqueous 0.2% diazinon emulsion, the liver, kidney, and fat contained 0.01, 0.002, and 0.330 mg of diazinon per kg. Other organs and tissues did not contain diazinon residues. Nineteen days after the calves were sprayed with 0.15% Dursban emulsion, a residue concentration of 0.016 mg/kg was determined only in fat. Sheep bathed in 0.05% diazinon emulsion contained 0.008 mg of diazinon per kg in their fat 33 days after application. In the same time, Dursban, applied in a bath as a 0.15% emulsion, was completely eliminated. The diazinon and Dursban residue level in veal decreased by 73-85% during storage for five days at a temperature 0 to +4°C, while cooking for 1.5 hr had little effect on the residue level.

73-2715. Matsneva, N. G.; Semikhatova, O. A. (Voronezh Inst. Agr., Voronezh, USSR). **Vliyaniye gerbitsidov na mikrofloru vyshchelochennogo chernozema. [Effect of herbicides on the microflora of alkaline chernozem.]** *Khim. Sel. Khoz. 11(3):222-224; 1973.* (Russian)

The effect of Eptam (EPTC), prometryne, and Eptam-prometryne and eptam-Alipur (cycluron+chlorbufam) mixtures, introduced into the soil of sunflower fields before sowing, was studied on soil microflora. Soil samples, taken from the upper 20 cm-layer during the periods of early growth, flowering, and ripening, were partly transferred into bean-peptone agar for microbiological investigations. All pesticides studied activated the proliferation of aerobic saprophytic bacteria growing in bean-peptone agar, and of spontaneously growing *Azotobacter*. The counts of such microorganisms, as determined during the periods of the flowering and ripening of sunflower, exceeded those in the control by 1.2 to 2.1 times, and sometimes even by 3 to 6.5 times. The presence of herbicides intensified proliferation of *Bacillus megaterium*, *B. mesentericus*, and *B. vulgatus*. The species spectrum of the fungal microflora (*Mucor*, *Penicillium*, *Fusarium*, *Botrytis* and *Aspergillum*) was similar to that found in the control.

73-2716. Nunoya, H. (Fac. of Med., Kurume Univ., Kurume, Japan). **[On the effects of organomercury compounds on rats and their fetus (a dissertation).]** *Kurume Igakkai Zasshi (J. Kurume Med. Ass.) 36(6): 432; 1973.* (Japanese)

The different effects of methyl mercury chloride and phenyl mercuric acetate (PMA) on the rat fetus are reported. An amount of the organic mercury compound small enough not to induce symptoms was injected s.c. to rats. The females were crossed with untreated male rats and body weight, behavior, fertility, number of litters, and malformation of newborns observed. Organomercury compounds caused decreased fertility and decreased weight of newborns; these trends were especially noticeable in animals treated with methyl mercury chloride. Determinations of mercury distribution in pregnant rats and their fetuses showed higher accumulation in the body and slower excretion with methyl mercury chloride. The determination of mercury in the fetus was carried out for confirmation of the translocation of mercury via placenta; this was more marked with methyl mercury chloride and scarcely found with phenyl mercuric acetate. This suggests the pathology of fetal Minamata disease.

73-2717. Suarez-A., G.; Ramiro-G., M. E.; Tapanes-D., J. J. (Cent. Invest. Pesqueras, Playa Habana, Bauta, Cuba). **Influencia del Dimecron en la supervivencia de la langosta *Panulirus argus* en relaction con la circulacion de agua sobre la plataforma de Cuba. [Effects of Dimecron on survival of the spiny lobster, *Panulirus argus*, in relation to the water circulation on the Cuban continental shelf.]** *IN: Marine Pollution and Sea Life, Fishing News (Books) Ltd., London, 1972, pp. 238-242.* (14 references) (Spanish)

LD50 of Dimecron (phosphamidon), a systemic insecticide widely used for rice culture in Cuba, was determined in the spiny lobster. The lobsters were maintained under standardized test conditions recommended by the American Public Health Association and kept in 60-liter plastic tanks filled with water containing 0.1-6.3 ppm phosphamidon. The 24-hr LD50 was 1.70 ppm; 48-hr, 0.57 ppm; 72-hr, 0.42 ppm; and 96-hr, 0.30 ppm. The minimum lethal concentration was 0.2-0.3 ppm. The hydrographic conditions prevailing on the Cuban shelf result in rapid dispersal of runoff from rice-growing areas and thus in rapid dilution of pesticide concentrations. Assuming uniform dispersal of the pesticide applied over the area receiving runoff, the resulting concentrations would be far too low to endanger the spiny lobster or other forms of marine life.

73-2718. Watari, N. (First Dept. of Anatomy, Nagoya City Univ. Med. School, Nagoya, Japan). **(Ultrastructural alterations of the mouse liver after the prolonged administration of BHC.)** *Nippon Rinsho Denshi Kembikyo Gakkai-Shi (J. Jap. Electron Microsc. Soc.) 5(4):1410-1420, 1449-1456; 1973.* (40 references) (Japanese)

Ultrastructural changes were seen in mouse liver after administration of γ-BHC (lindane) at 1 ppm in the drinking water for 2-12 months. Characteristic changes in the liver cells included initial dilation of rough endoplasmic reticulum into large vacuolated cisternae, followed by a change into lamellated cisternae with unevenly dotted ribosomes. Vesiculated smooth endoplasmic reticulum increased in glycogen, contrasting with the decreased number of glycogen particles. An increased number of autophagous vacuoles was digested via primary lysosomes, and excreted their contents to the outside of the cell by emiocyosis. The Golgi apparatus was atrophied, with increased numbers of primary lysosomes. Most of the mitochondria were greatly enlarged ("huge mitochondria"). The phagocytic activities of the Kupffer cells were increased, and the fat-storing cells contained an increased number of fat droplets along with some residual bodies. Although only small doses of BHC were administered, the liver changes were severe. This may have resulted from enterohepatic circulation of BHC between liver and small intestine via bile and blood. (From author abstract)

73-2719. Yamada, A. (Sch. of Pharmacol., Fac. of Med., Osaka Municipal Univ., Osaka, Japan). **[Teratogenic effects of organophosphorus insecticides in the chick embryo II.]** *Osaka Shiritsu Daigaku Igaku Zasshi (J. Osaka City Med. Cent.) 21(10-12): 345-355; 1972.* (32 references) (Japanese)

Eggs of White Leghorns were incubated for 96 hrs at 38°C and 55- 62% humidity and a solution of parathion in ethanol and olive oil injected into the air chamber to give 250 μg of parathion per egg. Eggs injected with 0.1 ml of ethanol-olive oil were used as controls. Cervical and thoracic vertebrae were examined by soft roentgenography; bone formation, tetracycline uptake, and enzyme activity were determined from days 9-19 of incubation. In the parathion treated group calcification of the cervical spine was delayed on days 13-14 and the vertebrae showed fusion on days 17-19. The calcium, phosphorus, and hydroxyproline contents and the tetracycline uptake were higher in the cervical spine of the parathion-treated group than in controls on day 19 of incubation. The activities of alkaline phosphatase and cathepsin increased suddenly on days 13-15 in controls; both activities were higher in the parathion-treated groups than in the control group on day 17. The activities of acid phosphatase and β-glucuronidase showed no clear change in the spine of the control group while those of the parathion-treated group were lower. The frequency of fusion was not larger in the thoracic vertebrae of the parathion-treated group than that in controls, and biochemical parameters did not differ from those of controls. It was suggested that malformation induced by parathion in the cervical spine is related to the activities of bone enzymes.

73-2720. McCollister, S. B.; Kociba, R. J.; Gehring, P. J. (Dow Chem. Co., Midland, MI 48640). **Studies on the acute and chronic oral toxicity of *O,O*-diethyl-*O*-(3,5,6-trichloro-2-pyridyl)phosphorothioate.** *Pharmacologist 15(2): 226; 1973.*

LD50 values for *O,O*-diethyl-*O*-(3,5,6-trichloro-2-pyridyl)phosphorothioate (chlorpyrifos) were 118-245 mg/kg for rats, 1000-2000 mg/kg for rabbits, 504 mg/kg for guinea pigs, and 32 mg/kg for chicks. In chronic studies, depression of plasma and red cell ChE was observed in rats given 1 or 3 mg/kg/day, and depression of brain ChE occurred in rats given 3 mg/kg/day. Plasma ChE in dogs was depressed with the 0.1, 1, and 3 mg/kg/day doses, and red cell ChE was depressed by 1 and 3 mg/kg/day. No adverse effects, as measured by mortality, body weight, food intake, hematology, urinalysis, organ weight, pathology, or tumor incidence, were observed in either species. Cholinergic response was not evident. (Abstract of a paper presented at the fall meeting of the American Society for Pharmacology and Experimental Therapeutics, held August 19-23, 1973, at Michigan State University, East Lansing, MI) (Abstract 396)

73-2721. Schwetz, B. A.; Gehring, P. J.; Kociba, R. J. (Dow Chem. Co., Midland, MI 48640). **Toxicological properties of pentachlorophenol relative to its content of chlorinated dibenzo-*p*-dioxins.** *Pharmacologist 15(2): 226; 1973.*

Octachlorodibenzo-*p*-dioxin, the least toxic of the chlorinated dibenzo-*p*-dioxins(CDD), was the predominant member of this class of compounds contaminating pentachlorophenol (PCP). No 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, the most toxic of the CDDs, has been detected in commercial PCP. None of the untoward effects observed with the CDDs were produced by purified PCP (99.9%) or by PCP made by a new process capable of producing the product with a significantly lower CDD content. (Abstract 397)

73-2722. Dieringer, C. S.; Thomas, J. A.; Stitzel, R. E. (Dept. Pharmacol., W. Virginia Univ. Med. Cent., Morgantown, WV 26506). **Influence of carbaryl on androgen metabolism in the prostate gland and liver.** *Pharmacologist 15(2): 226; 1973.*

Carbaryl, administered orally at 8.5, 17, or 34 mg/kg/day for 5 or 10 days, had no effect on the uptake of labeled testosterone by the prostate gland and had little effect on prostate gland or testicular weights. With the 10-day treatment the metabolism of testosterone to androstanediol and androstenedione significantly increased. No change was produced by carbaryl in the levels of radiometabolites in hepatic microsomal fractions. Increases in metabolism of testosterone by slices of mouse prostate gland were produced by carbaryl at 4×10^{-7} *M*. (Abstract 399)

73-2723. Thomas, J. A.; Schein, L. G.; Dieringer, C. (Dept. Pharmacol., W. Virginia Univ. Med. Cent., Morgantown, WV 26506). **Distribution of radioactivity in male reproductive organs after the administration of either carbaryl-^{14}C or DDT-^{3}H.** *Pharmacologist 15(2): 227;1973.*

DDT-^{3}H or its metabolites were detected in testes, prostate gland, vas deferens, brain, heart, lungs, spleen, diaphragm and, at higher levels, in adrenal gland and liver of dogs 30 or 60 min after injection. Dogs injected with radioactive carbaryl showed a distribution of activity in reproductive organs similar to that observed for DDT and its metabolites. Less radioactivity was found in the adrenal gland of dogs treated with carbaryl than in DDT-treated dogs. Oral administration of labeled carbaryl in mice resulted in distribution of radioactivity in the testes, prostate gland, seminal vesicles, and epididymis. (Abstract 400)

73-2724. Roberts, R. J.; Gibson, J. D. (Univ. Iowa Coll. Med., Iowa City, IA 52242). **Comparison of effects of alpha-naphthylisothiocyanate (ANIT) and phenobarbital (PB) on steady state sulfobromophthalein (BSP) disposition in the rat.** *Pharmacologist 15(2): 227; 1973.*

Data obtained from a study of the hepatic disposition of ^{35}S-sulfobromophthalein (BSP) indicated that α-naphthylisothiocyanate (ANIT) reduced canalicular secretory rate and hepatic BHP uptake while phenobarbital increased both functions. ANIT caused a rise in the percent free B^{35}SP in the cytosol and in the total concentration of B^{35}SP in cytosol and plasma when administered 10-12 hr prior to initiation of BSP administration.(Abstract 404)

73-2725. Brzezinski, J.; Ludwicki, K. (Dept. Toxicol. Chem., Inst. Biopharm., Med. Acad., 02-097 Warsaw, Poland). **The interrelationship of the changes of acetylcholine esterase and catecholamines blood and urine levels in rats poisoned with disyston.** *Pol. Pharmacol. Pharm. 25(3): 313-316; 1973.* (8 references)

In rats given disyston (disulfoton) orally at a dose corresponding to 40% of the LD50, a maximum of blood AChE inhibition was observed between the first and sixth hours. During this period catecholamine excretion in urine increased and blood catecholamines were elevated. Maximum inhibition of AChE in plasma corresponded to maximum catecholamine levels in blood although catecholamine levels returned to normal more rapidly than AChE levels. Maximum excretion of adrenaline and noradrenaline occurred during the first and second days, respectively. The results indicate that changes in catecholamines following poisoning with disyston are related to AChE inhibition, probably as a result of catecholamine liberation from stores by ACh. Rapid normalization of adrenaline and noradrenaline levels may be explained by the phenomenon of "autoinhibition" of the releasing action of ACh.

73-2726. Novy, D. S.; Majumdar, S. K.* (Biol. Dept., Lafayette College, Easton, PA 18042). **The effects of 2,4,5-trichlorophenoxyacetic acid on *Drosophila melanogaster*-1. Genotypic response.** *Proc. Pa. Acad. Sci. 46(12): 21-22; 1972.* (6 references)

No differential genotypic response was observed when four inbred strains of *D. melanogaster* were treated with 400, 700, or 1000 mg/kg 2,4,5-T for three weeks, but significant reductions in population were observed with all treatments. The average relative percent survival was > 75 for the control groups and < 5 for the groups treated at the two highest doses. A progressive reduction in the number of larvae was noted in food bottles as the concentration of herbicide was increased. In some instances where eggs were present at lower doses, larvae did not metamorphose; others developed into abnormally long, slender, black and sometimes withered pupae which did not produce flies.

73-2727. Foldesy, R. G.; Mineo, L.; Majumdar, S. K. (Dept. Biol., Lafayette College, Easton, PA 18042). **The effect of 2,4,5-trichlorophenoxyacetic acid on two nitrogen fixing bacteria.** *Proc. Pa. Acad. Sci. 46(12): 23-24; 1972.* (3 references)

Counts of *Azotobacter chroococcum* made 72 hr after incubation in broth cultures containing 2,4,5-T indicated that growth was almost completely inhibited at 1000 ppm and significantly reduced at 200 and 600 ppm. Although control populations had stabilized by 72 hr, the populations of treated cultures continued to increase up to 168 hr, suggesting adaptation of the bacteria. This adaptation was confirmed by serial subculturing. *Rhizobium leguminosarum*, tested in a similar manner, was even more sentitive to 2,4,5-T and was completely inhibited at 1000 ppm.

73-2728. Pritchard, H. N.; Dines, D. M. (Dept. Biol., Cent. Marine Environ. Studies, Lehigh Univ., Bethlehem, PA 18015). **DDT effects on oxygen evolution during photosynthesis.** *Proc. Pa. Acad. Sci. 46(12): 25-26; 1972.* (10 references)

Levels of 5 and 10 ppm DDT reduced the quantity of oxygen released during photosyntheis by *Scenedesmus quadricauda,* a common fresh water alga, during in vitro experiments. At 95 min about 40 times as much oxygen had been released by normal cells as by those treated with 10 ppm DDT and about 10 times as much as by those treated with 5 ppm. Generally, photosynthesis was impeded and respiration increased; more oxygen was used than produced after a 30-min exposure to light.

73-2729. Sideroff, S. I.; Santolucito, J. A. (Dept. Psychobiol., Univ. Calif., Irving, CA 92664). **Behavioral and physiological effects of the cholinesterase inhibitor carbaryl (1-naphthyl methylcarbamate).** *Physiol. Behavior 9(3): 459-462; 1972.* (12 references)

Rats bar-press trained for water reinforcement and given low intensity footshock with each lever-press response during the test session had a higher response rate when treated with carbaryl at about 1/60th LD50 than when not treated. This was found to be a result of delayed response to footshock rather than of increased drive for water. "Anticipatory" and "startle" response thresholds were significantly higher in carbaryl-treated rats, and these animals exhibited reduced water consumption and longer latencies in returning to the bar after receiving water reinforcement. The results can be viewed in terms of the necessity of having an optimum level of ACh in the brain, the possibility of a peripheral mechanism, or the possibility of sympathomimetic effects of carbaryl.

73-2730. Waid, J. S. (Dept. Bot., Univ. Canterbury, Christchurch 1, New Zealand). **The possible importance of transfer factors in the bacterial degradation of herbicides in natural ecosystems.** *Residue Rev. 44: 65-71; 1972.* (25 references)

A genetic mechanism is suggested whereby natural populations of microorganisms may become modified to decompose herbicides and other biodegradable molecules that resist decomposition. If small amounts of certain phenoxyacetic herbicides are applied to soil or water they disappear after a lengthy lag period. If a second much larger application is made a long time after the initial application the herbicide disappears rapidly. It is suggested that the episomal transfer of genetic information between bacteria may be an effective mechanism to conserve the potentiality of natural microfloras to degrade resistant molecules. (Author abstract by permission)

73-2731. Edwards, C. A.; Thompson, A. R. (Rothamsted Exp. Sta., Harpenden, Hertfordshire, England). **Pesticides and the soil fauna.** *Residue Rev. 45: 1-79; 1973.* (244 references)

Pesticides which reach the soil through direct application, runoff, or drift affect nontarget organisms, including the saprophagous invertebrates which help decompose leaf litter. Pesticides also affect the populations of predators that control undesirable species. Field experiments concerning the effects of organophosphates, organochlorines, and some carbamate insecticides, as well as herbicides and fumigants on soil invertebrates are reviewed. Indirect effects on the soil fauna may result from destruction of vegetation. Invertebrates may accumulate sublethal residues, especially of organochlorines, and the residues may cause changes in behavior, loss of reproductive effectiveness, and development of resistance. The residues may also be passed along to predators higher on the food chain. The timing and quantities of pesticides applied are related in a complex fashion to the effects on the soil fauna. (Author abstract by permission, abridged)

73-2732. Katan, J.; Eshel, J. (Dept. Plant Pathol. Microbiol., Hebrew Univ. of Jerusalem, Fac. Agr., Rehovot, Israel). **Interactions between herbicides and plant pathogens.** *Residue Rev. 45: 145-177; 1973.* (150 references)

Herbicides have a significant influence on various organisms in the environment in addition to their direct effect on the treated vegetation. Changes in the incidence of plant diseases may result from the application of herbicides through the effect they have on the pathogen, the host, or microorganisms in the environment. Herbicides belonging to different chemical groups increased diseases of many crop plants caused by fungi, viruses, and nematodes. The following four possible mechanisms may be responsible for the increase in disease due to herbicides: direct stimulatory effect on the pathogen, increased virulence of the pathogen, increased susceptibility of the host, and suppression of microorganisms antagonistic to the pathogen. Certain herbicides decrease some diseases; some of these have also been reported to increase the incidence of certain other diseases. The mechanisms involved in this phenomenon are discussed and examples are given. The control of increased disease incidence, either by combined application of herbicides and fungicides or by using different methods of application, is discussed. (Author abstract by permission)

73-2733. Vilceanu, R.; Szabadai, Z.; Chiriac, A.; Simon, Z. (Chem. Res. Cent., Univ., Timisoara, Rumania). **Multiple structure-toxicity correlation of organic phosphorus compounds.** *Stud. Biophys. 34(1): 1-6; 1972.* (8 references)

A quadratic regression equation was used to determine multiple correlation of toxicity in mice to various structural parameters for 49 organophosphates. These parameters included the number of atoms with proton acceptor character for hydrogen bonding, the hydrophobic increment, the aromatic character, and the electron accepting character for charge transfer complexes (number of nitro or nitrile groups). The linear correlation coefficient obtained for the 49 compounds was 0.252. The results suggest that the existence of a single atom with lone electron pairs would produce little toxicity while the absence of aromatic rings would result in high toxicity.

73-2734. Davy, F. B.; Kleerekoper, H.; Matis, J. H. (Dept. Biol., Texas A&M Univ., College Station, TX 77843). **Effect of exposure to sublethal DDT on the exploratory behavior of goldfish (*Carassius auratus*).** *Water Resour. Res. 9(4): 900-905; 1973.* (18 references)

Exposure to DDT at 10 ppb for four days did not appear to destroy the nonrandom exploratory locomotion of normal goldfish throughout a 20-hr monitoring period. In both treated and untreated fish the oscillation in the frequency of 5-min shifts in position and activity decreased gradually over the test period. Subtle changes, like different temporal oscillations of the frequency of shifts in position and the rate of activity and the different correlation between these parameters, were observed in DDT-treated fish. These alterations in a function most likely under the control of the central nervous system suggest that the central nervous system may be affected by sublethal levels of the pesticide.

73-2735. Lee, S. S.; Fang, S. C. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Metabolism of monuron in excised leaves of corn and bean plants.** *Weed Res. 13(1): 59-66; 1973.* (12 references)

The metabolism of monuron in excised leaves of bean (*Phaseolus vulgaris* L., var. Black Valentine) and corn (*Zea mays* L., var. Batam Cross) were studied with carbonyl-^{14}C-labeled monuron. The metabolic conversions of monuron in both plant species were exponential and followed first order reaction kinetics. The metabolism of monuron can be divided into two major pathways: demethylation and hydroxylation. At a monuron concentration of 16 ppm the hydroxylation was dominant in the bean leaves. As the concentration of monuron was increased the participation of the hydroxylation pathway became less, probably due to the inhibition of enzymes involved by monuron. The demethylation pathway was not affected by higher monuron concentration. In the corn leaf, however, sequential demethylation was always the major pathway of monuron transformation and there was no inhibitory effect observed on either pathway as the concentration of monuron increased. The following radioactive metabolites were found in the alcohol extract of bean and corn leaves receiving carbonyl-^{14}C-labeled monuron: *N'*-(4-chlorophenyl)-*N*-methylurea, *p*-chlorophenylurea, two polypeptide complexes of monuron, one polypeptide complex of *N'*-(4-chlorophenyl)-*N*-methylurea and β-*D*-glucosides of *N*-(2-hydroxy-4-chlorophenyl) urea, *N'*-(2-hydroxy-4-chlorophenyl) *N*-methylurea, and *N'*-(2-hydroxy-4-chlorophenyl)-*N,N*-dimethylurea. In addition, one minor radioactive peak was found only in the alcohol extract of corn leaves, which yielded four unidentified radioactive metabolites after acid or enzyme hydrolysis with β-glucosidase. (Author abstract by permission)

73-2736. Chasseaud, L. F.; Hawkins, D. R.; Cameron, B. D.; Fry, B. J.; Saggers, V. H. (Dept. Metabol. Stud., Huntingdon Res. Cent., Huntingdon, England). **The metabolic fate of bentazon in the rat.** *Xenobiotica 2(3): 269-276; 1972.* (6 references)

An oral dose of the new herbicide bentazon (3-isopropyl-4*H*-2,1,3-benzothiadiazin-4-one 2,2-dioxide) was absorbed rapidly and almost quantitatively in the rat. Radioautography using the labeled compound showed that absorption took place primarily from the stomach. Levels of radioactivity were high in the

stomach, liver, heart, and kidneys after 1 hour. Radioactivity was not detected in the brain or spinal cord. Excretion was primarily urinary: 91.1% of the administered dose of radioactivity was excreted in the urine within 24 hr. Less than 1% was excreted in the feces during 4 days after administration and less than 0.02% as $^{14}CO_2$ in the expired gases. After 4 days, 0.5% of the dose was recovered from the whole carcass. Unchanged bentazon excreted in the urine acounted for more than 84% of the administered dose. Two minor metabolites were detected, a nonpolar one accounting for 2.3% and a polar one accounting for 0.8% of the administered dose. Unknown radioactive material from the TLC plates accounted for the remainder. Incubation of urine and bile with glucuronidase/sulfatase reduced the metabolite content and restored the bentazon content, indicating that the polar metabolite may be a glucuronide.

73-2737. Bedford, C. T.; Robinson, J. (Shell Res. Ltd., Tunstall Lab., Kent, England). **The alkylating properties of organophosphates.** *Xenobiotica 2(4): 307-337; 1972.* (42 references)

A color test for alkylating agents using 4-(*p*-nitrobenzyl)-pyridine has been developed which allows quantitative determination of second-order rate constants for reactions at 37.5°C. These constants have been determined for dichlorvos and several other organophosphorus insecticides. These results are important in considering the chemical and biological reactivity of these compounds and in assessing the biological importance of their alkylating properties. Since dichlorvos is rapidly metabolized in mammals, the chances of its manifesting spontaneous deleterious biological alkylating activity are low. Structure/activity correlations suggest similar conclusions about other organophosphate insecticides, but not necessarily about simple alkyl phosphates such as trimethyl phosphate.

73-2738. Matsushima, T.; Weisburger, J. H. (Carcinogen Screening Sect., Exp. Pathol. Br., Nat. Cancer Inst., Bethesda, MD 20014) **Effect of carbon monoxide or of 3-aminotriazole on *C*- and *N*-hydroxylation of the carcinogen *N*-2-fluorenylacetamide by liver microsomes of hamsters pretreated with 3-methylcholanthrene.** *Xenobiotica 2(5): 423-430; 1972.* (29 references)

Incubation of liver microsomal systems from male hamsters with the carcinogen, *N*-2-fluorenylacetamide, resulted in formation of several carbon- and nitrogen-hydroxylated metabolites. Intraperitoneal injections of 3-methylcholanthrene at 100 mg/kg increased hydroxylated metabolite formation; incubation under carbon monoxide decreased it. In animals pretreated with three intraperitoneal injections of amitrole at 1 g/kg in a 24-hour period, a relative increase in *N*-hydroxyl-*N*-2-fluorenylacetamide production occurred, accompanied by severe decreases in yields of 3-, 5-, and 7-hydroxy derivatives. Amitrole reduced production of all hydroxylated metabolites in animals pretreated with methylcholanthrene. The results support the hypothesis of a multiplicity of hydroxylating enzymes.

73-2739. Franklin, M. R. (Dept. Biopharm. Sci., Coll. Pharm. Univ. Utah, Salt Lake City, UT 84112). **Piperonyl butoxide metabolism by cytochrome P-450: factors affecting the formation and disappearance of the metabolite-cytochrome P-450 complex.** *Xenobiotica 2(6): 517-527; 1972.* (19 references)

Incubation of piperonyl butoxide with mouse and rat liver microsomes in the presence of NADPH and oxygen produced a metabolite-cytochrome P-450 complex which had 430 and 455 nm absorbance maxima in the difference spectrum. The maximum absorbance change at 455 nm was proportional to the protein concentration (cytochrome P-450). It was necessary for the cytochrome to be in the reduced state to observe the metabolite-cytochrome P-450 complex. Observation of the spectrum after addition of NADH depended on the time elapsed since the maximum formation of the complex. When excess NADPH and oxygen and limiting concentrations of piperonyl butoxide were present, formation of the complex occurred rapidly, but subsequent removal of the absorbing species was very slow. The presence of piperonyl butoxide did not reduce the rate of NADPH oxidation to below the endogenous rate. Hexobarbital or metyrapone did not significantly decrease the decay rate of the piperonyl butoxide metabolite-cytochrome P-450 complex, suggesting that the removal of the 455 nm absorbing species was not due to mixed function oxidation. Cysteamine did not increase the rate of decay. Conjugation reactions with uridine diphosphate-glucuronic acid or *S*-adenosylmethionine were also unsuccessful in altering the rate of disappearance of the complex. The stability of the complex could contribute to the synergistic activity of piperonyl butoxide.

73-2740. Hart, M. M.; Whang-Peng, J.; Sieber, S. M.; Fabro, S.; Adamson, R. H. (Lab. Chem. Pharmacol., Tumor Cell Biol. Br., Nat. Cancer Inst., NIH, Bethesda, MD 20014). **Distribution and effects of DDT in the pregnant rabbit.** *Xenobiotica 2(6): 567-574; 1972.* (9 references)

DDT administered to pregnant rabbits crosses the placenta and accumulates in high concentrations in the fetus and the maternal uterus, liver, ovaries, and placenta, which regulate the fetal environment. Whole-body levels of DDT metabolites in the fetus are higher 17 days after DDT administration to dams than are the fetal plasma DDT levels, indicating that DDT does not rapidly leave the fetal tissue. Whole-body levels of DDT in the fetus are also higher than those found in placenta or maternal plasma, but are half as high as the levels in maternal liver. Administration of DDT to pregnant rabbits at 10 or 50 mg/kg early in gestation caused

increased incidence of prematurity, increased number of fetal resorptions, and a decrease in fetal weight. Treatment late in gestation did not have such deleterious effects. Early gestation periods may be more susceptible to harmful effects of DDT because of the involvement of hormonal factors, which are altered by DDT, in early fetal development. DDT at the doses tested did not increase the incidence of chromosomal aberrations in maternal or fetal tissue. Exposure in vitro to levels up to 100μg/ml caused no abnormalities.

73-2741. Waring, R. H. (Dept. Biochem., Univ. Birmingham, Birmingham, England). **The metabolism of Vitavax by rats and rabbits.** *Xenobiotica 3(2): 65-71; 1973.* (13 references)

Up to 50% of a dose of 1 mmol/kg of Vitavax (carboxin) was not absorbed from the gut of rats, and up to 16% was excreted in the feces of rabbits. Unchanged fungicide was also excreted in the urine of both animals. Carboxin sulfoxide, reported to be a metabolite in the dog, was not recovered from the treated animals. The major metabolites were glucuronides of phenols formed through hydroxylation of carboxin, and formation of glucuronides seemed to be more prevalent among older rabbits. After administration of ^{14}C-labeled carboxin, radioactivity appeared in the salivary gland, liver, kidney, and gastrointestinal tract. No significant ring scission occurred in vivo.

73-2742. Meng, W.; Meng, S. (Med. Universitaetsklin. und Poliklin., Ernst-Moritz-Arndt-Univ., Greifswald, DDR). **Diagnostik und Therapie des endogenen Hyperkortisolismus (Cushing-Syndrom). [Diagnosis and therapy of endogenous hypercortisolism (Cushing's syndrome).]** *Z. Aerztl. Fortbild. 66(20): 1025-1031; 1972.* (9 references) (German)

Diagnostic and therapeutic problems of Cushing's syndrome are reviewed. Cytotoxic drugs such as *o,p'*-DDD (TDE) are used in the drug therapy of Cushing's syndrome. Temporary remissions of metastatic carcinoma of the adrenal cortex following *o,p'*-DDD therapy have been reported.

See also **73-2553** **73-2561** **73-2564** **73-2573** **73-2574** **73-2575** **73-2576** **73-2589** **73-2590** **73-2608** **73-2609** **73-2610** **73-2611** **73-2615** **73-2626** **73-2628** **73-2746** **73-2756** **73-2777**

73-2743. MacQueen, J.; Plaut, D. (Chem. Res. Dev. Dept. Dade, Div. Amer. Hosp. Supply Corp., Miami, FL 33152). **A review of clinical applications and methods for cholinesterase.** *Amer. J. Med. Technol. 39(7): 279-287; 1973.* (66 references)

Human exposure to organophosphates results in a decreased level of serum ChE and a subsequent decrease in the amount of active erythrocyte ChE. Since periodic screening of enzyme levels is necessary for persons occupationally exposed to these pesticides and for diagnosis of other disorders, a number of methods have been developed. Titrimetric and electrometric methods depend on the measurement of acid formed (pH). Colorimetric procedures which measure this parameter have some drawbacks although that which uses *m*-nitrophenol is satisfactory. Spectrophotometric assay using chromogenic substrates or sulfur reagents are frequently used, and for high sensitivity a GLC procedure which involves the measurement of the hydrolysis product of 3,3-dimethylbutyl acetate has been developed.

73-2744. Chau, A. S. Y. (Water Qual. Div., Inland Waters Branch, Dep. Environ., Ottawa, Canada). **Analysis of chlorinated hydrocarbon pesticides in waters and wastewaters. Methods in use in Water Quality Division laboratories.** *Inland Waters Branch, (Canada) Dep. of the Environment, Ottawa, 1972, 56 p.* (64 references)

Methods used in the laboratories of the Water Quality Division of the Deptartment of the Environment for the analysis of organochlorines in water depend primarily on GLC. GLC column materials used include Chromosorb W and Gas Chrom Q solid phases and liquid phases of various polarities such as methyl silicone gum rubber, silicone grease, and trifluoropropyl silicone. Preparation and packing of the columns are critical to the success of the determination, and preconditioning the column with pesticide gives better results, particularly with dieldrin, endrin, methoxychlor, and DDT. Proper cleaning of equipment and purification of solvents and chemicals is also necessary. Confirmation of pesticide identification involves derivatization followed by GLC, TLC, spectroscopy, spectrophotometry, NMR, MS, or column chromatography. A single method utilized in the laboratory can be used to determine lindane, heptachlor, heptachlor epoxide, *p,p'*-DDE, aldrin, dieldrin, *p,p'*-DDD (TDE), *p,p'*-DDT, endrin, *p,p'*-methoxychlor, *α*-endosulfan, and *β*-endosulfan. With modifications, other pesticides and their degradation products can be determined.

73-2745. Ellin, R. I.; Burkhardt, B. H.; Hart, R. D. (Biomed. Lab., Dept. Army, Edgewood Arsenal, MD 21010) **A time-modified method for measuring red blood cell cholinesterase activity.** *Arch. Environ. Health 27(1): 48-49; 1973.* (1 reference)

Sampling time for red blood cell (RBC) cholinesterase determinations by the Michel procedure can be decreased from 60 to 17 minutes by increasing the sample volume fivefold. The longer than expected reaction time in the modified procedure is due to the increased buffering effect of the RBC. The average RBC value of tests performed in duplicate on 59 subjects was 0.81 for the 60-minute method and 0.82 for the 17-minute method. Excellent correlation between the two methods also results when RBC inhibited with sarin are compared. (Author abstract by permission)

73-2746. Hart, G. J.; O'Brien, R. D. (Sect. Neurobiol. Behav. Cornell Univ., Ithaca, NY 14850). **Recording spectrophotometric method for determination of dissociation and phosphorylation constants for the inhibition of acetylcholinesterase by organophosphates in the presence of substrate.** *Biochemistry 12(15): 2940-2945; 1973.* (29 references)

The kinetics of AChE inhibition by organophosphates were studied by running the reactions in the presence of a chromogenic substrate, *p*-nitrophenyl acetate, in a Beckman Acta III double-beam recording spectrophotometer. Only one concentration of inhibitor and of substrate was necessary when the zero-time method was used to calculate affinity, phosphorylation, and bimolecular reaction constants. Experiments with a series of *O,O*-diethyl (*ω-tert*-butalkyl) phosphates demonstrated an increasing inhibitory potency with increasing length of butalkyl chain except in the case of addition of the first methylene group. Paraoxon was more inhibitory than the *O,O*-diethyl (*ω-tert*-butalkyl) phosphates, primarily because of a greater affinity.

73-2747. Shafik, T. M. (Perrine Primate Lab., P. O. Box 490, Perrine, FL 33157). **The determination of pentachlorophenol and hexachlorophene in human adipose tissue.** *Bull. Environ. Contam. Toxicol. 10(1): 57-63; 1973.* (15 references)

Low levels of pentachlorophenol (PCP) and hexachlorophene (HCP) were detected in human fat using a GC procedure. Hexane extraction of ground tissue removed unwanted chlorinated hydrocarbons, and basic extraction of the hexane-tissue mixture yielded a solution of the chlorinated phenols. The solutions were acidified and extracted with ether, and diazoethane was added to ethylate the phenols. Column chromatography on silica gel was used to separate the products, each was analyzed on a different column on the GC. The electron-capture detector was sensitive to approximately 2.5 pg of ethylated PCP and 40 pg ethylated HCP. Average recoveries of PCP and HCP from fortified samples of human adipose tissue were 75% and 96%, respectively, and samples from the general population contained up to 80 ppb HCP and up to 52 ppb PCP.

73-2748. Sodergren, A. (Dept. Anim. Ecol., Univ. Lund, S-223 62 Lund, Sweden). **A simplified clean-up techni-**

que for organochlorine residues at the microliter level. *Bull. Environ. Contam. Toxicol. 10(2): 116-119; 1973.* (5 references)

A system was devised for preparing samples of limited volume or amounts of organochlorine residues for GC determination and requiring only 350 μl. of extract. The 350 μl of hexane extract was divided into three portions for gravimetric fat determination, sulfuric acid-silica gel clean-up, and potassium hydroxide treatment (for confirmatory purposes). All mixing and separation was achieved in sealed glass micropipettes or capillary tubes, and storage of the clean-up mixture did not affect the results. Recoveries from fortified samples ranged from 78 to 94% depending on the extraction procedure employed.

73-2749. Wilhelm, K.; Vandekar, M.; Reiner, E. (Dept. Toxicol., Inst. Med. Res. Occup. Health, Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Comparison of methods for measuring cholinesterase inhibition by carbamates.** *Bull. WHO 48(1): 41-44; 1973.* (9 references)

The Acholest and tintometric methods are used widely for measuring blood cholinesterase activity after exposure to organophosphorus compounds. However, if applied for measuring blood cholinesterase activity in persons exposed to carbamates, the accuracy of the methods requires verification since carbamylated cholinesterases are unstable. The spectrophotometric method was used as a reference method and the two field methods were employed under controlled conditions. Human blood cholinesterases were inhibited in vitro by four methylcarbamates that are used as insecticides. When plasma cholinesterase activity was measured by the Acholest and spectrophotometric methods, no difference was found. The enzyme activity in whole blood determined by the tintometric method was < 11% higher than when the same sample was measured by the spectrophotometric method. (Author abstract by permission)

73-2750. Wilhelm, K.; Reiner, E. (Inst. Med. Res. Occup. Health, Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Effect of sample storage on human blood cholinesterase activity after inhibition by carbamates.** *Bull. WHO 48(2): 235-238; 1973.* (10 references)

During an operational field trial with propoxur it was observed that the inhibition of whole blood cholinesterase was greater when samples were stored before the assay. Since measurement of cholinesterase activity is not always possible immediately after sampling, the effects of different storage conditions were evaluated. Human blood cholinesterases were inhibited in vitro by methylcarbamates and stored at different pH values, temperatures, and sample dilutions. The results showed that the degree of cholinesterase inhibition does not change if samples are diluted 300-fold with buffer at pH 5.0 at 4°C and the enzyme activity measured within 4 hours after dilution. These conditions of storage were equally satisfactory for each of the three methylcarbamates studied and are therefore likely to apply to other carbamates as well. (Author abstract by permission)

73-2751. Corcoran, E. F. (Univ Miami, Sch. Marine Atmospher. Sci., Miami, FL 33149). **Gas-chromatographic detection of phthalic acid esters.** *Environ. Health Perspect. 3:13-15; 1973.* (5 references)

Chlorinated hydrocarbon analyses were performed in 1970 and 1971 on samples of water, suspended material, sediments, and benthic organisms from the Mississippi River, the Mississippi River delta system, and the adjacent Gulf of Mexico. Samples were extracted with hexane and the extract concentrated to 5 ml. Two chromatographic columns were used to separate the chlorinated hydrocarbons: 5% QF-1 on 80/90 Gas Chrom Q and 1.5% OV-17 plus 1.95% QF-1 on 80/90 Gas Chrom Q. The extract was examined by GLC using an electron capture detector without further cleanup. Three large, late-eluting peaks in the chromatograms could not be identified as pesticides. TLC examination indicated that the material involved was not chlorinated. Chromatographic peaks matching those of the environmental samples were given by two plasticizers extracted from laboratory tubing, butylglycol butyl phthalate, and di-2-ethylhexyl phthalate (dioctyl phthalate). Rough calculations suggest phthalate ester contents of about 0.6 ppm in the Mississsippi River water. Waters off Escambia Bay contained smaller amounts of these substances, and still smaller concentrations were found in Gulf Stream water.

73-2752. Goodson, L. H.; Jacobs, W. B. (Life Sci. Div., Midwest Res. Inst., Kansas City, MO 64110). **Rapid detection system for organophosphates and carbamate insecticides in water.** *Environmental Protection Technology Series, Report Number EPA-R2-72-010, 1972, 66p.* (18 references)

A system has been developed which responds rapidly to low levels of cholinesterase antagonists in water supplies. In this system, called Cholinesterase Antagonist Monitor or CAM-1, the activity of an immobilized cholinesterase preparation is determined periodically in an electrochemical cell. CAM-1 has successfully detected toxic and subtoxic levels of dichlorvos, monocrotophos, carbaryl, paraoxon, dimetilan, malathion, and parathion. A rough correlation exists between the rat toxicities of the insecticides and their levels detected by CAM-1. The inhibition of cholinesterase is both the cause of toxicity and the means of detection. The sensitivity of CAM-1 to low levels of insecticides in water is the result of the affinity of these insecticides for the reactive sites on the surfaces of the immobilized enzyme; the enzyme functions as a selective concentrator of the materials to be detected. The device can operate unattended for 48 hr. Operators in water

treatment facilities should watch for hazardous spills of insecticides and be acquainted with appropriate counter measures.

73-2753. Thielemann, H. (Halberstadt, DDR). **Duennschicht-chromatographische Trennung und semiquantitative Bestimmung von Toxaphen und Lindan (γ-Hexachlorcyclohexan) an aktivierten Silufol Fertigfolien. [Thin-layer chromatographic separation and semiquantitative determination of toxaphene and lindane (γ-hexachlorocyclohexane) on activated Silufol ready-made sheets.]** *Fresenius Z. Anal. Chem. 264(1): 32; 1973.* (1 reference) (German)

Despite the broad use of toxaphene, especially on blossoming crops where protection of honeybees is important, analytical methods for toxaphene in mixed formulations have previously been inadequate. Ready-made TLC sheets consisting of silica gel with incorporated fluorescent indicator on reinforced aluminum foil (Silufol Fertigfolien UV 254) are used for separating toxaphene and lindane. The sheets are washed with acetone, then activated for 30 min at 110°C. Development with cyclohexane/chloroform (80/20), drying in air, treatment with ammoniacal silver nitrate, and UV irradiation for 30 min reveals toxaphene at an *Rf* value of 0.84 and lindane at an *Rf* of 0.43. The *Rf* for toxaphene is 0.96 and for lindane, 0.79 when carbon tetrachloride/petroleum ether (50/50) is used as the solvent. As little as 0.3 μg toxaphene and as little as 0.4 μg lindane can be detected on the sheets.

73-2754. Herzel, F.; Lahmann, E. (Inst. Wasser-, Boden-, Lufthyg. des Bundesgesundheitsamtes, Berlin-Dahlem, Germany). **Polyaethylen-beschichtetes Silicagel als Sorbens fuer organisch-chemische Fremdstoffe in Luft. [Polyethylene-coated silica gel as a sorbent for organic pollutants in air.]** *Fresenius Z. Anal. Chem. 264(4): 304; 1973.* (German)

For analysis of organic trace substances, such as pesticides, in air, silica gel with particle sizes of 0.2 to 0.5 mm was coated with rigid polyethylene amounting to about 10% of the weight of the support. The polyethylene was dissolved in an organic solvent (e.g., Decalin), and the silica gel added. Tests were carried out with two successive absorption tubes, 12 mm in diameter, filled with 2-4 g polyethylene-coated silica gel. Air with a low-level pesticide content was drawn through the tubes at the rate of 2-3 m^3/day. Lindane, aldrin, dieldrin, DDT, parathion, polychlorinated biphenyls, and the herbicides dichlobenil and desmetryne were present in the air. The retention efficiency was very good. The ratio of pesticides detected in the sorbent of the first tube to that in the second tube was 250-20,000:1.

73-2755. Beyermann, K.; Eckrich, W. (Inst. Anorg. Anal. Chem., Univ. Mainz, Germany). **Adsorption von Spuren von Insecticiden aus Wasser an Polyaethylen. [Adsorption of traces of insecticides from water on polyethylene.]** *Fresenius Z. Anal. Chem. 265(1): 1-4; 1973.* (2 references) (German)

Factors influencing the adsorption of traces of DDT and lindane from water on granules and flakes of polyethylene and polypropylene were studied using ^{14}C-labeled DDT and lindane. The rates of adsorption of DDT in 1 hr and of lindane in 2 hr were 86% and 65%. The rate of adsorption was independent of the pesticide concentration in the range of 3 to 300 ng/10 ml. The adsorption efficiency of 0.1 g of polyethylene granules was 96% for DDT and 52% for lindane, and no considerable increase in these efficiencies was evidenced with increased polyethylene expenditure. Equilibrium between adsorption and desorption was established in 2 hr in water. The concentration ratio of the insecticide in water and on polyethylene in a DDT concentration range of 0.01-1 μg/ml was 0.45, and a 5.3 ratio was obtained for a lindane range of 0.01-10 μg. Lindane and DDT metabolites formed in alkaline medium are not readily absorbed by polyethylene and polypropylene. The absorption is determined by the surface area rather than by the weight of the adsorbent. Mineral oil, as well as such additives as chalk, clay, and kieselguhr in the water strongly reduced the percentage of the insecticide adsorbed on polyethylene by adsorbing it themselves, which makes adsorption of insecticides on polyethylene and polypropylene unsuitable for analytical purposes.

73-2756. Beyermann, K.; Eckrich, W. (Inst. Anorg. Anal. Chem., Univ. Mainz, Germany). **Gas-chromatographische Bestimmung von Insecticid-Spuren in Luft. [Gas-chromatographic determination of traces of insecticides in air samples.]** *Fresenius Z. Anal. Chem. 265(1): 4-7; 1973.* (4 references) (German)

The collection of pesticides from air samples is possible by means of adsorption on polyethyleneglycol layers that are spread on stainless steel nets. The adsorbed pesticides are dissolved in benzene and determined by gas chromatography. Typical concentrations found in some air samples are: aldrin 150 ng/m^3, DDT 300 ng/m^3, and Daconil (chlorothalonil) a few μg/m^3. About 50% of the insecticide concentration is retained in the respiratory system as is demonstrated by the analyses of the inspired air and the expired air. (Author abstract by permission)

73-2757. Hladka, A.; Kovac, J. (Inst. Ind. Hyg. Occup. Dis., Bratislava Inst. Agr. Technol., Bratislava, Czechoslovakia). **Isolation and cleanup of organophosphorus insecticides and their oxones from animal tissues.** *Fresenius Z. Anal. Chem. 265(5): 339-342; 1973.* (10 references)

A simple isolation and cleanup procedure has been developed for the determination of organophosphorus

insecticides and their oxones in animal tissues. This procedure combines extraction of organophosphorus pesticides and their oxones with partial cleanup by column chromatography. Most polar coextracts remain on the column, and in its further processing the eluate does not tend to form emulsions. The process has been studied on model mixtures of ^{32}P- and ^{14}C-labeled pesticides with tissues as well as after administration of pesticides to white rats. The average recovery with the procedure is 90.5% with a standard deviation of ± 5.1%. (Author abstract by permission)

73-2758. Novikova, K. F.; Leshchinskaya, L. I. (All-Union Res. Inst. Chem. Plant Protect., Moscow, USSR). **O razdel'nom opredelenii ostatochnykh kolichestv metilnitrofosa v yablokakh i vode kolorimetricheskim metodom. [Fractional determination of methylnitrophos residues in apples and water by a colorimetric method.]** *Gig. Sanit. 37(11): 80-82; 1972.* (1 reference) (Russian)

A colorimetric method is presented for the total and fractional determination of methylnitrophos (fenitrothion) in apples and water. For the determination of total fenitrothion (4-nitrophenyl and 6-nitrophenyl isomers), the sample is extracted with aqueous acetone, then the residue partitioned into chloroform. After evaporation of the solvent, methylnitrophos is subjected to vacuum sublimation, followed by alkaline hydrolysis with sodium hydroxide, and spectrophotometric determination at 405 nm. The average recovery in the determination is 75.5 ± 14.2%. For separate determination of the isomers, the acidified chloroform extract of the hydrolyzate is transferred onto a silica gel column to separate 6-nitrocresol from 4-nitrocresol. The optical density is read at 420 and 400 nm respectively for 6-nitrocresol and 4-nitrocresol.

73-2759. Vengerskaya, Kh. Ya.; Abal'yants, A. A. (Tashkent Sci. Res. Inst. Forensic Med., Tashkent, USSR). **Obnaruzheniye gerbitsidov — proizvodnykh mocheviny metodom kristallizatsii v tonkom sloye. [Identification of urea-derived herbicides by thin-layer crystallization.]** *Gig. Sanit. 38(2): 65-67; 1973.* (Russian)

A method is described for the identification of monuron, diuron, Cotoran (fluometuron), meturin, and Herban (norea) by thin-layer crystallization. The sample to be tested is dissolved in a solvent. The solution is applied to glass plates for evaporation of the solvent and crystallization of the herbicide. The crystals obtained are specific for the individual herbicides. Monuron and diuron are crystallized from acetone, Cotoran from diethyl ether, meturin from chloroform, and Herban from methyl alcohol.

73-2760. Parouchais, C. (State Govt. Dept. Chem., Adelaide, South Australia 5000). **Determination of diuron in wheat.** *J. Ass. Offic. Anal. Chem. 56(4): 831-833; 1973.* (16 references)

A simplified analytical procedure is described for the determination of diuron residues in a large number of wheat grain samples. The sample is subjected to Soxhlet extraction with acetone, the extract is dissolved in an acetone-aqueous phase (1+5) and then extracted with petroleum ether, and diuron is extracted into methylene chloride and carbon tetrachloride. Electron capture GLC is the determinative step, with ultraviolet spectrophotometry as an alternative technique. (Author abstract by permission)

73-2761. Olive, B. M. (Off. Pestic. Programs, Tech. Serv. Div., EPA, Beltsville, MD 20705). **Color-specific reagent for identification and semiquantitation of pyrethrins and piperonyl butoxide by thin layer chromatography.** *J. Ass. Offic. Anal. Chem. 56(4): 915-918; 1973.* (6 references)

A color-specific reagent, a mixture of phosphoric, tannic, and acetic acids and acetone, has been adapted for the thin layer chromatographic identification and quantitation of pyrethrins and piperonyl butoxide in pesticide formulations. Approximately 1 μg of either pyrethrin or piperonyl butoxide can be detected as pink and blue spots, respectively, in aerosol and solid formulations. (Author abstract by permission)

73-2762. Chen, J. Y. T. (Div. Chem. Phys., Food Drug Admin., Washington, DC 20204). **Infrared studies of chlorinated dibenzo-*p*-dioxins and structurally related compounds.** *J. Ass. Offic. Anal. Chem. 56(4): 962-975; 1973.* (20 references)

Reference infrared spectra of 24 chlorinated dibenzo-*p*-dioxins (DPD) and structurally related compounds are presented. These reference spectra are recorded using micro quantities of synthesized compounds in order to obtain spectra like those expected from chlorinated DPD residue isolates. The observed characteristic frequencies are tabulated in correlation tables. Their significance is interpreted in terms of the substituents and electronic effects. The positions of various absorption bands depend on the total number and positions of the chlorine substituents. The positions of the absorption bands indicate relative bond strengths. (Author abstract by permission)

73-2763. Sawyer, L. D. (Food Drug Admin., Minneapolis, MN 55401). **Collaborative study of the recovery and gas chromatographic quantitation of polychlorinated biphenyls in chicken fat and polychlorinated biphenyl-DDT combinations in fish.** *J. Ass. Offic. Anal. Chem. 56(4): 1015-1023; 1973.* (13 references)

Nine laboratories collaborated on the analyses of PCBs in chicken fat and DDT-PCB combinations in fish. Existing AOAC multipesticide methodology with GLC

quantitation was employed. One solution containing a mixture of Aroclors 1254 and 1260 was analyzed by GLC only. The fish samples were subjected to a published silicic acid procedure for separating the DDT-PCB mixtures. The DDT analogs were quantitated before and after the separation. The PCB content was quantitated by total peak height and total area comparisons against appropriate Aroclor(s), using electron capture GLC, and additionally in 6 laboratories by total area comparisons, using halogen-specific detection. The electron capture GLC data demonstrated better accuracy and precision. The following PCB recoveries were obtained by using total peak height comparisons: 5 ppm mixed Aroclor solution, 100±4%; 8 ppm Aroclor 1242-fortified chicken fat, 101±13%; 7.5 ppm Aroclor 1248-fortified chicken fat, 96±9%; incurred Aroclor 1242 chicken fat, 9.2 ppm±8%; 6 ppm Aroclor 1254-fortified fish, 75±15%; and an environmentally incurred residue in fish, 4.5 ppm±20%. The 2 Aroclor-fortified fish samples were concurrently spiked with the *p,p'*-isomers of DDE, TDE, and DDT at levels of 4, 1, and 3 ppm, respectively. After silicic acid separation the combined recoveries for these 2 samples were: DDE, 86± 13%; TDE, 89±20%; and DDT, 84±17%. Environmentally incurred DDT residues were recovered at 4.1 ppm±14% for *p,p'*-DDE, 0.7 ppm±24% for *o,p'*-DDT, and 2.7 ppm±17% for *p,p'*-DDT. The DDT values calculated before the silicic acid separation compared favorably with those summarized. The multiresidue method for chlorinated pesticides, 29.001-29.027, has been adopted official first action to include polychlorinated biphenyls in poultry fat and fish. (Author abstract by permission)

73-2764. Watts, R. R.; Storherr, R. W. (Regist. Div., EPA, Washington, DC 20460). **Negative finding of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in cooked fat containing actual and fortified residues of ronnel and/or 2,4,5-trichlorophenol.** *J. Ass. Offic. Anal. Chem. 56(4): 1026-1027; 1973.* (3 references)

Beef fat containing residues of ronnel and its metabolite 2,4,5-trichlorophenol at 46.0 and 2.8 ppm, respectively, was examined before and after cooking for presence of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. Fat samples fortified at 2000 ppm with 2,4,5-trichlorophenol or its sodium salt were cooked at 500°F for periods of 6 to 22 hr. No tetra-dioxin was found in any of the samples, using a method with a sensitivity limit of 0.05 ppm. (Author abstract by permission)

73-2765. Morries, P. (Chem. Bacteriol. Lab., Health Dept., Bolton, England). **A note on the determination of diphenyl and *ortho*-phenyl phenol in citrus fruit by gas chromatography.** *J. Ass. Pub. Anal. 11(2): 44-46; 1973.* (5 references)

Both diphenyl and *ortho*-phenyl phenol are sufficiently volatile to be amenable to gas chromatographic separation and determination. Only the peel is used in the determination, since it has been shown that diphenyl and *o*-phenyl phenol on the surface of citrus fruit remain dissolved in the oil of the peel oil cells. Peel from a weighed quantity of citrus fruit is removed, weighed, cut into small pieces, and 50 g is blended in a high-speed macerator with 10 ml of fluorene internal standard solution, 0.5% in diethyl ether, plus additional ether as needed for convenient handling. The mixture is filtered with suction, then the extraction step repeated. Filtrates are combined, dried, and evaporated to ca. 5 ml, but not to dryness. Then 1 to 5 µl of the extract is injected into a gas chromatograph equipped with a glass column packed with 15% ethylene glycol adipate polyester on 100-200 mesh Chromosorb. A column temperature of 180°C, a nitrogen flow rate of 20 ml per minute, and a flame ionization detector with a hydrogen flow rate of 20 ml per minute are used. Using this method, the limits of detection of diphenyl and *o*-phenyl phenol are about 1 ppm and 5 ppm respectively, but these can be reduced.

73-2766. Bush, B.; Lo, F. C. (N. Y. Dept. Health, Div. Lab. Res., Albany, NY 12201). **Thin-layer chromatography for quantitative polychlorinated biphenyl analysis.** *J. Chromatogr. 77(2): 377-388; 1973.* (20 references)

The use of silica gel plates and hexane for identification of polychlorinated biphenyls, naphthalenes and terphenyls is discussed. Quantitation of polychlorinated biphenyls is described using a linear, thin-layer chromatographic scanner and silver nitrate/UV chromogenesis. Sensitivity is 0.5 ppm in muscle tissue, egg and fat with a precision of ±0.05 ppm. In this study, *p,p'*-DDE and aldrin were eliminated by oxidation to dichlorobenzophenone and dieldrin, respectively, using a chromic acid oxidation step. For qualitative work, DDE need not be removed, and may be distinguishable from the polychlorinated biphenyls on the chromatogram. (Author abstract by permission, supplemented)

73-2767. Mendoza, C. E. (Health Protect. Branch, Dept. Nat. Health Welfare, Ottawa, K1A OL2, Canada). **Thin-layer chromatography and enzyme inhibition techniques.** *J. Chromatogr. 78(1): 29-40; 1973.* (21 references)

Thin-layer chromatography continues to be an integral part of analytical chemistry because it is versatile, sensitive, simple and rapid. The application of enzymatic methods to thin-layer chromatography is becoming more important. This chromatographic-enzymatic technique has been developed for studies of metabolic pathways of pesticides, residue analyses and forensic chemistry. The discussions deal with the development of chromatographic techniques using enzymatic reactions to detect pesticides and other biologically active compounds, principles of the technique, comparison of detection limits by various methods and enzymes, and practical applications of the technique and methods of quantitation. (Author abstract by permission)

73-2768. Janak, J.; Martinu, V.; Ruzickova, J. (Inst. Instrument. Anal. Chem., Czech. Acad. Sci., Brno, Czechoslovakia). **Ultratrace analysis (below ppb) by coupling centripetal thin-layer chromatography and gas chromatography.** *J. Chromatogr. 78(1): 127-131; 1973.* (4 references)

A method for the determination of ultratrace amounts of lindane by centripetal thin-layer chromatography combined with gas chromatography under common laboratory conditions is described. The method was used for the determination of pesticide contents in the dry materials obtained from cabbage from a trial field. The accuracy of the analysis under the conditions easily available in routine work is 0.1 ppb. The sensitivity limit of the method is 0.001 ppb with analytical precision. (Author abstract by permission)

73-2769. Massart, D. L. (Pharm. Inst., Vrije Univ. Brussel, B-1640 Sint Genesius Rhode, Belgium). **The use of information theory for evaluating the quality of thin-layer chromatographic separations.** *J. Chromatogr. 79: 157-163; 1973.* (10 references)

The possiblity of using information theory for characterizing thin-layer chromatographic separations is investigated. It appears that the information content, as defined by the Shannon equation, can be used to compare the merits of different solvents used for the separation of the same group of compounds. One example of the application of this method is given by the separation of DDT and 12 metabolites and related compounds on aluminum oxide in 33 solvent systems. It was not possible to choose among these solvent systems by inspection, but an examination of the information content produced using these systems revealed that three were clearly superior. Further optimization can be obtained by slightly varying the ratios and types of components in these superior systems, e.g., from *n*-hexane-acetone-acetic acid (95:5:1) to *n*-hexane-acetone-acetic acid (90:10:1) or *n*-pentane-acetone-acetic acid (95:5:1). (Author abstract by permission, supplemented)

73-2770. Mallet, V.; Surette, D.; Brun, G. L. (Dept. Chem., Univ. Moncton, Moncton, N. B., Canada). **Detection of naturally fluorescent pesticides on silica gel layers.** *J. Chromatogr. 79: 217-222; 1973.* (21 references)

A number of fluorescent pesticides, namely, benomyl, coumatetralyl, diphacinone, fuberidazole, propyl isome and quinomethionate, have been investigated on silica gel thin-layer chromatograms. Fluorescence spectra have been measured and visual detection limits have been estimated. In most cases, as little as a few nanograms can be detected. In addition, the effects of heat treatment on the fluorescence have been observed. The most pronounced effect is a large bathochromic shift of the fluorescence excitation and emission maxima. (Author abstract by permission)

73-2771. Brun, G. L.; Mallet, V. (Dept. Chem., Univ. Moncton, Moncton, N. B., Canada). **Detection of organophosphorous pesticides by in situ fluorometry on thin-layer chromatograms.** *J. Chromatogr. 80(1): 117-123; 1973.* (5 references)

A method for the detection of organophosphorus pesticides directly on thin-layer chromatograms is described. One approach involves heating the chromatogram for a definite period of time at a specific temperature. The other requires spraying the chromatoplate with a strong acid or base prior to the heat-treatment. From a total of thirty-five organophosphorus pesticides investigated, twelve gave positive results. Instrumental limits of detection at the nanogram level are possible. (Author abstract by permission)

73-2772. Huss, M.; Adamovic, V. M. (Dept. Sanit. Chem., Inst. Pub. Health Serbia, Belgrade, Yugoslavia). **Determination of ametrine *[sic]* and atrazine residues in soil by thin-layer chromatography.** *J. Chromatogr. 80(1): 137-139; 1973.* (9 references)

A TLC procedure which was capable of detecting levels of 0.005 ppm triazine was developed for the determination of atrazine and ametryne in mixtures in the soil. Soils were dried, made basic with ammonia, and extracted with ether. An aliquot of the ether was evaporated. The residue was dissolved in chloroform and chromatographed on a fluorescent alumina plate using carbon disulfide-ethyl acetate as carrier. The two resulting spots, detected under UV light, were eluted with chloroform, the solution was chromatographed on plates of Silica Gel G254 with carbon disulfide-ethyl acetate. Area of the spots, which was proportional to the concentrations within the limits between 0.5 and 2.0 μg, was observed under UV light. Recoveries were 100% for atrazine and 80% for ametryne; the presence of organochlorines did not interfere with the assay.

73-2773. Elkin, K.; Pierrou, L.; Ahlborg, U. G.; Holmstedt, B.; Lindgren, J. E. (Dept. Toxicol., Swedish Med. Res. Council, Karolinska Institutet, Stockholm 60, Sweden). **Computer-controlled mass fragmentography with digital signal processing.** *J. Chromatogr. 81(1): 47-55; 1973.* (13 references)

A system for multiple ion detection has been developed in which both the control of the gas chromatograph-mass spectrometer (GC-MS) and signal processing are confined to the computer. The computer focuses on a certain mass by adding to the accelerating voltage of the GC-MS a voltage from a digital to analog converter and booster amplifier. The digital treatment of the signals offers more satisfactory control of the baseline and gain and at the same time allows expansion of the number of channels without hardware modification. The sampled data are continually displayed on the oscilloscope of the computer and all questions and answers are observed on the oscilloscope. The operator

can set a baseline level, sample rate and gain for each channel. The data and calculated results are displayed on the oscilloscope and can be presented as hard copy on the teletype or plotter. The usefulness of the new system is demonstrated with regard to the metabolism of pentachlorophenol (PCP) in the rat. (Author abstract by permission)

73-2774. Baker, P. B.; Farrow, J. E.; Hoodless, R. A. (Dept. Trade Ind., Lab. Gov. Chem., London, SE1 9NQ, England). **Agricultural fungicides I. Identification of systemic fungicides using thin-layer chromatography.** *J. Chromatogr. 81(1): 174-177; 1973.* (9 references)

A thin-layer chromatographic method was developed for the identification of eight widely-used systemic fungicides. Since no single TLC system found would separate all eight fungicides, a number of different systems is used together with a coding scheme. Solutions containing the unknowns are spotted onto each of four TLC sheets (3 silica gel and 1 aluminum oxide), then developed in four solvent systems (one of the sheets is run twice). After drying, the sheets are divided into four equal horizontal sections corresponding to *Rf* values of 0.0-1.0. Compound spots are visualized first by observation under UV light of wavelength 254 nm, then by spraying with potassium iodobismuthate solution followed by exposure to bromine vapor. The sections in which the spots appear on each sheet are recorded as a composite code of four letters in the sequence corresponding to the arbitrary chromatographic system number. Comparison with codes obtained for standards affords preliminary identification, which is then confirmed by chromatography on a sheet or sheets along with standard spots of the suspected fungicides. Detection limits were 0.25-1.0 μg; tridemorph and dodemorph could not be separated with any of the solvent systems tested.

73-2775. Angoso, M.; Jimeno, F.; Grau, A.; Dominguez, G. (Junta Energia Nucl., Madrid, Spain). **Isotopic dilution determination of Lebaycid in oranges.** *J. Radioanal. Chem. 13(1): 149-154; 1973.* (6 references)

A method was developed for the analysis of Lebaycid (fenthion) residues in oranges which was capable of determining 50 μg of the material with an error of 2%. Separation was achieved by homogenization in acetonitrile, filtration, evaporation of solvent, dissolution of residue in methanol and water, and extraction into hexane. Extracts were further purified on an alumina column and a silica gel TLC plate. UV spectrophotometry or isotope dilution, in which 50 μg of labeled Lebaycid was added to the unlabeled pesticide, was used for the determining step. Approximately 30,000 counts were accumulated with the radiometric measurement so that the standard deviation was $< 1\%$.

73-2776. Polyakova, V. N.; Trondina, G. A. (All-Union Sci. Res. Inst. Exp. Vet., Moscow, USSR). **Identifikatsiya khlorsoderzhashchikh pestitsidov metodom khromatografii v tonkom sloye. [Identification of chlorine-containing pesticides by thin-layer chromatography.]** *Khim. Sel. Khoz. 10(7): 521-522; 1972.* (2 references) (Russian)

A thin-layer chromatographic method is described for the identification of DDT, DDE, DDD (TDE), lindane, dichlorvos, and trichlorfon in plant and animal samples by means of a selective chromogen. The pesticide-containing sample is applied to silica-gel layer. A 50%-solution of *o*-tolidine in acetone is used for visualization of bluish-green spots in UV light. The solvent systems found best for separation and identification are *n*-hexane for DDT, DDE, DDD, and lindane; 5:1 ratio of hexane-acetone for combinations of lindane with trichlorometaphos-3 (ronnel) and 1:1 ratio of hexane-acetone for combinations of trichlorfon, dichlorvos, and trichlorometaphos-3. Pesticide groups containing chlorine are identified by the color of the visualized spot, while the particular pesticide is identified by the corresponding *Rf* value. The sensitivity of the method is 5 μg per sample.

73-2777. Romina, L. I. (All-Union Sci. Res. Inst. Dairy Ind., USSR). **Fotometricheskoye opredeleniye ostatkov karbofosa v moloke, myase i raznotrav'ye. [Photocolorimetric determination of carbofos residues in milk, meat, and grass.]** *Khim. Sel. Khoz. 10(11): 844-845; 1972.* (Russian)

A spectrophotometric method is described for the determination of carbofos (malathion) residues in milk, meat, and grass samples. Carbofos is successively extracted from the samples by means of distilled water and carbon tetrachloride and by the addition of sodium sulfate, hydrochloric acid, iron chloride, and copper sulfate. The carbon tetrachloride extract is transferred into a photometric cuvette, and the optical density relative to pure carbon tetrachloride is measured at 400 nm within 2 to 3 min following extraction. A calibration curve is plotted for standard solutions of 0.1, 0.25, 0.5, 1.0, 1.5, and 2.0 ml. The sensitivity of the method is 25 μg per sample. The recovery of carbofos ranged from 80 to 96%. Some 0.004% of the total carbofos dose of 600 mg/kg, administered to a rabbit orally, was found in the oblongate muscles 24 hr after administration.

73-2778. Novikova, K. F.; Mel'tser, F. R.; Aldoshina, T. V. (All-Union Sci. Res. Inst. Chem. Plant Protect., Moscow, USSR). **Opredeleniye izofosa-2 v zerne risa i vode kolorimetricheskim metodom. [Colorimetric determination of isofos-2 in rice grains and water.]** *Khim. Sel. Khoz. 11(1): 51-53; 1973.* (4 references) (Russian)

A procedure for the extraction and colorimetric determination of isofos-2 (*O*-(2,4-dichlorophenyl)*N*-isopropylamido chloromethylthiophosphonate) in rice

grains and in water is described. The method is based on the alkaline hydrolysis of isofos-2 to sodium 2,4-dichlorophenolate which in the presence of 4-aminoantipyrine and potassium ferricyanide gives stable coloration. Extraction from either rice grains or water is done with petroleum ether and the extract purified with acetonitrile. The dry extract is combined with ethanol and sodium carbonate for hydrolysis, after which sulfuric acid, 4-aminoantipyrine, and potassium ferricyanide are added. The resulting colored product is extracted with chloroform, and spectrophotometric determination is performed at 475 nm. The sensitivity of the method for rice grains and water is 0.4 and 0.04 mg/kg. The percentage of extraction is 91.2% with an accuracy of ±4.4%.

73-2779. Raskin, M. S.; Uskova, L. A.; Sviridenko, A. S.; Ryzhkov, A. A.; Babin, Ye. P. (Author address not given). **Opredeleniye 2-metoksi-3,6-dikhlorbenzoynoy kisloty v rasteniyakh. [Determination of dicamba (2-methoxy-3,6-dichlorobenzoic acid) in plants.]** *Khim. Sel. Khoz. 11(2): 130-133; 1973.* (14 references) (Russian)

A combined gas chromatographic and biological method is described for the determination of dicamba in plants. Ten days after the application of dicamba at 0.2 mg/m^2 on the soil in which corn plants were grown, the lower leaves were removed, crushed, dried, and extracted in a Soxhlet apparatus by means of a 1:1 mixture of diethyl ether with sulfuric acid. The ether extract, obtained after distillation and concentration, was halved for gas chromatographic determination and for bioassay. The residue content was calculated using a calibration curve from the growth retardation of the third leaves of bean plants after application of dicamba extract to the seed leaves. Unlike the gas chromatographic method, the bioassay is also suitable for the detection of dicamba metabolites within the total dicamba residue content. The detection limit of the combined method is 0.01 μg per plant.

73-2780. Sharova, V. M.; Kozhemyakin, N. G. (Leningrad Vet. Inst., Leningrad, USSR). **Fotoelektrokolorimetricheskoye opredeleniye metafosa i ftalofosa v tkanyakh eksperimental'no otravlennykh ptits. [Photoelectrocolorimetric determination of metaphos and phthalophos in tissues of experimentally poisoned birds.]** *Khim. Sel. Khoz. 11(3): 229-230; 1973.* (1 reference) (Russian)

A photocolorimetric method is described for the determination of residues of metaphos (methyl parathion), phthalophos (phosmet), and *p*-nitrophenol, a metabolite of the former that is formed in warm-blooded animals, in tissues of experimentally poisoned chickens. A tissue sample weighing 10 g is extracted with 60% aqueous solution of acetone; the resulting extract is combined with 10% alcoholic sodium hydroxide for the hydrolysis of metaphos to *p*-nitrophenol. After hydrolysis the sample is diluted with distilled water and extracted with carbon tetrachloride; to the upper aqueous layer a 1% aqueous solution of sodium carbonate is added and it is again extracted with carbon tetrachloride. The upper aqueous layer containing *p*-nitrophenol is used for the determination of metaphos against a calibration curve. Phthalophos is quantitatively hydrolyzed for colorimetric determination to sodium dimethyldithiophosphate by the addition of 10% alcoholic solution of sodium hydroxide. After neutralization of the base and the addition of copper sulfate, the resulting yellow complex is extracted with carbon tetrachloride. The sensivitity of the colorimetric method for metaphos and phthalophos is 0.2 mg/kg and 0.5 mg/kg, respectively.

73-2781. Stillman, R.; Ma, T. S.* (Dept. Chem., City Univ. New York, Brooklyn, NY 11210). **Application of high-speed liquid chromatography to organic microanalysis. I. Construction of a simple and inexpensive apparatus.** *Mikrochim. Acta 4: 491-506; 1973.* (40 references)

A simple, inexpensive system for LC (liquid chromatography) capable of separating compounds with speed and sensitivity comparable to or better than those of commercial units is described. Long narrow bore columns packed with extremely fine particles were fitted with an injection port at one end and a polarographic flow cell and electronic measuring circuit at the other. A high pressure solvent pumping device was necessary with these columns. The system was tested with parathion and methyl parathion using Corasil/C_{18} columns and a mobile phase of 0.05 *M* KCl in water/methanol. The limit of detection for each compound was about 0.01 μg and the response was linear over a concentration from 0.01 to 10μg/5μl of injection solution.

73-2782. Drucker, B. (St. Louis Bur. Pub. Health Lab. Serv., St. Louis, MO). **A rapid screening method for the detection of multiple chlorinated hydrocarbon pesticide residues in raw milk.** *Pub. Health Lab. 31(3): 87-101; 1973.* (8 references)

A procedure for the detection of seven organochlorines in raw milk was developed. The new method is less time-consuming, less expensive, and less dangerous than the standard FDA procedure or published alternatives. Extraction of the fat from the milk was accomplished according to the FDA procedure, but instead of acetonitrile partitioning, Florisil chromatography was used. Various mixtures of petroleum ether:diethyl ether were used to elute the pesticides. The method was satisfactory for qualitative or quantitative (GC) determination of *p,p'*-DDT, *p,p'*-DDE, heptachlor epoxide, aldrin, heptachlor, lindane, and α-BHC, but for legal purposes the FDA procedure should be run on contaminated samples.

73-2783. Ehle, H. (Biol. Bundesans. Land- und Forstwirt., Lab. Bot. Mittelpruef. Braunschweig, Germany). **Microbiological methods for detecting dressings on treated seeds.** *Residue Rev. 45: 125-143; 1973.* (38 references)

A number of microbiological methods for detecting different dressings (mostly mercurial compounds) on treated seeds have been developed. The standard bioassay method involves placing the seeds to be investigated on a solid agar medium previously inoculated with a sensitive microorganism (a fungus or bacterium). While the test organism grows, the dressing diffuses from the treated seed into the medium. After an adequate incubation period a clear, circular zone is produced in the medium around each seed due to growth inhibition of the microorganism. The inhibition zones are measured and correlated with the amount of the dressing carried by the seeds. Various factors such as dosage rate of the dressing, depth of the medium, amount of inoculum, etc. influence the size of the inhibition zone. Therefore, a standardized technique is required for a successful performance of the bioassay. Microbiological methods have been used for merely detecting the presence or absence of dressings on seeds, for testing the uniformity of seed treatments, and for determining the loss of a dressing, e.g., due to volatilization of the active compound. (Author abstract by permission)

73-2784. Brandt, K.; Walczyk, W. (Polymer Dept. Polish Acad. Sci., Zabrze, Poland). **Analiza zwiazkow fosforoorganicznych. [Analysis of organic phosphorus compounds.]** *Wiad. Chem. 27(4):221-248; 1973.* (175 references) (Polish)

Different analytical methods used between 1964 and 1971 for the determination of organophosphorus compounds are reviewed. In the first part of the paper the determination of phosphorus in organophosphate compounds is discussed. Included are the direct methods such as flame spectroscopy, roentgen and radiometric methods, and indirect methods including wet and dry methods in solid or gaseous state. The quantitative methods include colorimetric, turbidimetric, nephelometric, polarimetric, kinetic, polarographic, potentiometric, coulometric, and acid-base titration. The second part of the paper is devoted to a discussion of methods of the separation and analysis of organophosphate compound mixtures by paper, gas, and thin-layer chromatography. In addition, infrared absorption spectrophotometry and nuclear magnetic resonance spectroscopy are considered briefly.

73-2785. Pence, R. J.; Lomax, P. (Dept. Entomol., Univ. California, Los Angeles, CA 90024). **The honeybee abdomen preparation as a pharmacological test system.** *Z. Angew. Entomol. 69(4): 337-342; 1971.* (4 references)

Movements of the abdominal segments of outgoing forager honeybees, measured with a piezoelectric transducer, were characteristic of different pesticides tested. The duration of survival of these insect preparations corresponded to LD50s of the compounds. The abdomen was supported on a wire cradle and could be positioned stereotaxically so that a fine needle connected to the crystal could be brought into contact with the preparation. Insecticides placed in contact with the preparation, which included malathion, diazinon, methyl demeton, carbaryl, and propoxur, caused periods of increased and decreased activity of varying frequency and duration. Chlordane showed a similar phasic activity while aldrin and dieldrin did not. Prolonged survival (46 hr) was observed with DDT, but not DMDT. Recognition of response pattern, timing and intensity, may be useful for rapid qualitative and quantitative analysis of trace pesticide levels.

See also 73-2560

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